152301

HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Newtown Creek

Date Prepared: September 2009

Contact Persons:

Site Investigation: Dennis Munhall
U.S. Environmental Protection Agency
New York, NY

Documentation Record: Dennis Munhall
U.S. Environmental Protection Agency
New York, NY

Pathways, Components, or Threats Not Scored

Surface Water: The Surface Water Migration Pathway Drinking Water Threat was not scored because the Human Food Chain and Environmental Threats produce an overall score above the minimum required for the site to qualify for the National Priorities List. In addition, there are no surface water intakes along the target distance limit.

Ground Water: The Ground Water Migration Pathway is not scored because there are no drinking water wells located within 4 miles of the site, and the pathway does not contribute significantly to the site score.

Soil Exposure: Although the proposed site consists of a contaminated sediment plume, there are numerous properties and facilities along the banks of Newtown Creek from which soil contamination might have contributed to the sediment contamination. However, soil contamination was not considered in scoring the site because there is not sufficient information. The Soil Exposure Pathway is not scored because it does not contribute significantly to the site score based on the available data.

Air: No samples were collected to characterize the Air Migration Pathway; therefore, there is no documentation of an observed release. The Air Migration Pathway is not scored because it does not contribute significantly to the site score.

The Ground Water, Soil Exposure, and Air Pathways might be evaluated further during future investigations because evaluation of those pathways might lead to identification of contributing sources of sediment contamination.

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HRS DOCUMENTATION RECORD

Name of Site:	Newtown Creek	Date Prepared: September 2009
EPA ID No.:	NYN000206282	
EPA Region:	2	
Street Address of Site*:	South end of Ivy Hill Rd, Brooklyn, NY 11211, 11101, 11222, 11237, 11378 (Most significant zip code [i.e., largest Creek segment] is 11222)	
County and State:	Kings/Queens Counties, New York	
General Location in the State:	New York City (southeast portion of state)	
Topographic Map:	Brooklyn, NY	

Latitude*: 40° 42′ 54.69” North (40.715192°) Longitude*: 73° 55′ 50.74″ West (-73.930762°)

Site Reference Point: Sample location NC-SD71A

[Figure 1 of this HRS documentation record; Ref. 3, p. 1; 4, p. 1; 5, p. 1]

* The street address, coordinates, and contaminant locations presented in this Hazard Ranking System (HRS) documentation record identify the general area where the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Scores

Ground Water Pathway	Not Scored
Surface Water Pathway	100.00
Soil Exposure Pathway	Not Scored
Air Pathway	Not Scored
HRS SITE SCORE	50.00

WORKSHEET FOR COMPUTING HRS SITE SCORE
NEWTOWN CREEK

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	Not Scored	
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	100.00	10,000.00
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	Not Scored	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100.00	10,000.00
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	Not Scored	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	Not Scored	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	10,000.00	
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	50.00	

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
NEWTOWN CREEK

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	not scored
2b. Runoff	25	not scored
2c. Distance to Surface Water	25	not scored
2d. Potential to Release by Overland Flow (lines 2a [2b + 2c])	500	not scored
3. Potential to Release by Flood		
3a. Containment (Flood)	10	not scored
3b. Flood Frequency	50	not scored
3c. Potential to Release by Flood (lines 3a x 3b)	500	not scored
4. Potential to Release (lines 2d + 3c)	500	not scored
5. Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics		
6. Toxicity/Persistence	*	not scored
7. Hazardous Waste Quantity	*	not scored
8. Waste Characteristics	100	not scored
Targets		
9. Nearest Intake	50	not scored
10. Population		
10a. Level I Concentrations	**	not scored
10b. Level II Concentrations	**	not scored
10c. Potential Contamination	**	not scored
10d. Population (lines 10a + 10b + 10c)	**	not scored
11. Resources	5	not scored
12. Targets (lines 9 + 10d + 11)	**	not scored
13. DRINKING WATER THREAT SCORE ([lines 5 x 8 x 12]/82,500)	100	not scored

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
NEWTOWN CREEK

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+08
16. Hazardous Waste Quantity	*	10,000
17. Waste Characteristics	1,000	1,000
Targets		
18. Food Chain Individual	50	45
19. Population		
19a. Level I Concentrations	**	0
19b. Level II Concentrations	**	0.03
19c. Potential Human Food Chain Contamination	**	0.0000003
19d. Population (lines 19a + 19b + 19c)	**	0.0300003
20. Targets (lines 18 + 19d)	**	45.0300003
21. HUMAN FOOD CHAIN THREAT SCORE ([lines 14 x 17 x 20]/82,500)	100	100.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
NEWTOWN CREEK

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioaccumulation 24. Hazardous Waste Quantity 25. Waste Characteristics	* * 1,000	5.00E+08 10,000 1,000
Targets		
26. Sensitive Environments 26a. Level I Concentrations 26b. Level II Concentrations 26c. Potential Contamination 26d. Sensitive Environments (lines 26a + 26b + 26c) 27. Targets (line 26d)	 ** ** ** ** **	 0 100 not scored 100 100
28. ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500)	60	60.00
29. WATERSHED SCORE (lines 13 + 21 + 28)	100	100.00
30. SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE (S_{of})	100	100.00
SURFACE WATER MIGRATION PATHWAY SCORE (S_{sw})	100	100.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

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SITE SUMMARY

The Newtown Creek site (CERCLIS ID No. NYN000206282) in Brooklyn (Kings County) and Queens (Queens County), New York consists of contaminated sediments and water of Newtown Creek above the contaminated sediments. The site presently does not include the shoreline or areas beyond the shoreline. The contamination stems from a long and varied industrial history. The site location includes the geographic coordinates of 40° 42′ 54.69” north latitude (40.715192°) and 73° 55′ 50.74″ west longitude (-73.930762°) [Figure 1 of this HRS documentation record; Ref. 3, p. 1; 4, p. 1; 5, p. 1]. Newtown Creek is a tidal arm of the New York-New Jersey Harbor Estuary that forms the northwestern-most border between the New York City boroughs of Brooklyn and Queens [Figures 1 and 2 of this HRS documentation record; Ref. 4, p. 1; 6, p. 1; 7, p. 3; 8, p. 10; 9, p. 3; 10, pp. 6-7]. It is tributary to the East River and includes five branches along its 3.5- to 4.3-mile reach: (from east to west) English Kills, East Branch, Maspeth Creek, Whale Creek, and Dutch Kills [Ref. 4, p. 1; 6, p. 1; 7, p. 5; 8, p. 10; 9, p. 3; 11, p. 11; 12, p. 53]. The creek and its branches have a total surface area of approximately 165 to 170 acres [Ref. 12, p. 53; 13, p. 2]. Newtown Creek is surrounded by active and vacant industrial use along its length, with residential neighborhoods generally set back a few blocks [Ref. 9, pp. 3-4]. With the exception of a few rezoned portions, the entire waterfront is zoned M3 for heavy manufacturing and industrial uses [Ref. 9, p. 6; 12, p. 59; 14, p. 6]. The creek offers only one point of public access, and it has just one residential building along its banks [Ref. 7, p. 5]. The only significant open space nearby is the Calvary Cemetery in Queens [Ref. 4, p. 1; 9, pp. 18-19]. Figure 1 shows the full extent of the Newtown Creek site.

Historically, Newtown Creek drained the uplands of western Long Island and flowed through wetlands and marshes, with natural depths of 12 feet at its mouth to 4 feet at the head of navigation [Ref. 8, pp. 9-10, 31; 9, p. 5; 12, p. 21]. However, the historic tributaries were covered over as the region developed and nearly the entire creek was lined with bulkheads, cutting off natural freshwater flow [Ref. 6, pp. 1-2; 8, pp. 9-10, 31; 9, p. 5; 11, p. 12; 12, p. 21]. Current flow into Newtown Creek consists exclusively of storm water runoff, combined sewer overflows (CSO), and discharges from permitted and unpermitted pollution sources [Ref. 6, p. 1; 8, p. 10; 9, pp. 4, 8; 11, pp. 11, 21-22; 12, p. 22]. The creek rises and falls with the tide, but it is mostly stagnant [Ref. 6, p. 2; 8, p. 9]. Newtown Creek is a navigable waterway, and the channel must be maintained for shipping purposes [Ref. 9, p. 6; 15, p. 1]. New York State Department of Environmental Conservation (NYSDEC) classifies it as Class SD saline surface water, which should be suitable for fishing and fish survival [Ref. 12, pp. 22, 40]. However, testing by New York City Department of Environmental Protection (NYCDEP) indicates that Newtown Creek does not always comply with the Class SD fish survival standard for dissolved oxygen [Ref. 11, p. 11; 12, pp. 22-23, 41, 355-356].

The area surrounding Newtown Creek was settled by the Dutch in the mid-1600s. Prior to that time, there was a Native American village at the head of the stream and a small Norman settlement near its mouth [Ref. 8, p. 9]. The arrival of the Dutch led to farms and plantations lining both shores of the creek until the mid-1800s, at which time rapid industrial development of the area began [Ref. 7, p. 1; 8, pp. 9-10; 11, p. 12; 16, p. 2]. By the 1850s, Newtown Creek had become an industrial center [Ref. 7, p. 1]. It was home to the country’s first kerosene refinery in 1854 and first modern oil refinery in 1867 [Ref. 8, p. 10; 9, p. 5; 11, p. 12]. By 1870, an estimated 50 refineries were located along the banks of Newtown Creek [Ref. 16, p. 2]. By the end of the 19th century, the creek was lined with oil refineries and petrochemical plants, fertilizer and glue factories, copper-smelting and fat-rendering plants, shipbuilders, sugar refineries, hide tanning plants, canneries, sawmills, paint works, and lumber and coal yards [Ref. 7, p. 1; 8, p. 10; 9, p. 5; 11, pp. 12-14]. In the early 1900s, Newtown Creek was one of the key industrial arteries in New York City, with more than 500 enterprises lining the creek at its peak [Ref. 7, p. 1]. The creek was also jammed with commercial vessels, with large boats bringing in fuel and raw materials and taking out oil, fat, varnish, chemicals, and metals [Ref. 7, p. 1; 9, p. 5]. In addition to the industrial pollution that occurred from this brisk commerce, discharge of raw sewage directly into the water began in 1865 [Ref. 12, pp. 21, 52].

Beginning in the late 1800s and continuing into the 1930s, Newtown Creek was widened, deepened, and lined with bulkheads to accommodate the growing traffic, leading to the destruction of all its freshwater sources [Ref. 8, p. 10; 12, p. 52]. During World War II, the government commandeered factories along the creek to make military equipment, such as a factory that made aluminum for fighter planes [Ref. 11, p. 14]. At that time, Newtown Creek was the busiest industrial port in the Northeast, with tanker traffic lining its length [Ref. 7, p. 1; 11, p. 13]. The national highway system built after the war took business away from the nation’s waterways, leading to a rapid decline in the level of industry along Newtown Creek [Ref. 7, pp. 1-2].

Despite the diversion of commerce away from Newtown Creek beginning in the 1950s, some industrial operations continued through the latter half of the 20th century and even into the 21st century [Ref. 9, pp. 5-6; 12, p. 53; 16, pp. 2-3]. Chemical manufacturing continued at the Phelps Dodge facility until 1983 [Ref. 11, pp. 75-76; 14, pp. 7-8]. ExxonMobil [or its predecessors] was the largest of several oil companies that used property in the Greenpoint neighborhood of Brooklyn as a major oil refinery and storage depot until the 1990s, and BP America Inc. continues to use a portion of the property for bulk fuel storage [Ref. 7, p. 13; 13, pp. 2-5; 16, p. 3]. The BCF Oil facility was used for petroleum distribution until 1980 and for waste oil recycling from 1980 until 1994 [Ref. 17, p. 5]. The Greenpoint Energy Center, which functioned as a large manufactured gas plant (MGP) until 1952, was converted to liquefied natural gas (LNG) in 1968 and continues to be a major supplier of energy for New York City [Ref. 18, pp. 6, 11-12]. Other current operations along the creek include a cement plant, scrap yard, beverage distributor, construction supply company, recycling plant (decontaminates soil and pulverizes used concrete), plumbing-fixture showroom, dry ice manufacturer, and adult bookstore [Ref. 7, pp. 3, 7; 9, pp. 4-6]. Existing conditions also include vacant and contaminated properties clustered along the creek, pollution within the creek itself, and polluted ground water due to historic spills [Ref. 9, p. 3].

Due to its industrial past and ongoing pollution, Newtown Creek has gained notoriety as one of the nation's most polluted waterways [Ref. 6, p. 1; 7, pp. 3-5; 9, p. 2; 12, p. 21; 13, pp. 2-3, 9-10]. Many businesses along Newtown Creek still operate without city-provided sewer services [Ref. 7, p. 7]. There are 23 permitted CSO discharges and more than 200 other storm water or industrial discharges to Newtown Creek [Ref. 11, pp. 20-22, 103; 12, pp. 96-102]. The creek is home to the largest urban oil spill in North American history [Ref. 7, pp. 5, 13-14, 18; 11, p. 21; 13, pp. 2-4; 16, p. 3-4, 17-34]. Observations of the ongoing pollution problem in recent years have included slicks of garbage in Greenpoint; odors of sewage, brine, sulfur, and burning rubber; and a patch of muddy water with a rusty "tomato soup" tint [Ref. 7, pp. 4-6]. Another observation included a large white plume of sediment pouring into the waterway from an underwater drainpipe adjacent to a cement plant. Subsequent testing showed the sediment to be an illegal discharge from the plant that was high in calcium [Ref. 7, p. 7].

There have been a number of government-initiated efforts to clean up portions of Newtown Creek. In the early 1990s, New York State declared that Newtown Creek was not meeting water quality standards for dissolved oxygen and fecal coliform levels under the Clean Water Act [Ref. 9, p. 10]. NYSDEC has a consent decree agreement with ExxonMobil and other parties to clean up the massive historic oil spill. Under the consent decree, ExxonMobil has pumped out more than 9.3 million gallons of underground oil [Ref. 7, p. 14; 19, pp. 1-3]. Cleanup of the Phelps Dodge site began in 1999 and remedial construction activities in the upland areas of the site are reported to be complete [Ref. 11, pp. 17-19]. The Newtown Creek Water Pollution Control Plant (WPCP), New York City's largest wastewater treatment plant, opened in 1967 and serves 1 million residents in a drainage area of more than 15,000 acres [Ref. 20, p. 3]. Upgrade of the plant began in 1998, and the first four of eight new digester eggs came online in May 2008 [Ref. 20, pp. 1, 3]. The digesters will process up to 1.5 million gallons per day (mgd) of sludge, and the upgraded plant will serve a projected population of 1.33 million people by 2045 with a capacity to 700 mgd during wet weather storms [Ref. 20, pp. 2-3]. However, CSO events still discharge more than 2.7 billion gallons of storm water and raw sewage into Newtown Creek each year during wet weather [Ref. 9, p. 4].

Despite the ongoing pollution problems associated with Newtown Creek, the waterway and waterfront are in the early stages of restoration. Blue-claw crabs, bluefish, weakfish, striped bass, and other species inhabit the creek, and fishing and crabbing for human consumption occurs [Ref. 7, pp. 2, 5; 8, p. 11; 21, p. 13; 22, pp. 1-2; 24, p. 143; 52, p. 93; 68, p. 3; 69, p. 1; 76, p. 1]. Waterfowl are prevalent and kayakers have recently begun to take to the water [Ref. 7, p. 2, 4; 8, pp. 11, 48-59, 74-77, 81; 21, p. 13; 23, p. 5]. Wetland plants are beginning to take over the abandoned bulkheads and sediment piles, and school children are experimenting with growing oysters [Ref. 8, pp. 11, 70-73]. NYCDEP opened the Waterfront Nature Walk at the Newtown Creek WPCP in September 2007, allowing public access to the waterfront for the first time in decades [Ref. 8, pp. 90-101; 20, p. 3].

There have been efforts to assess sediment and water quality in Newtown Creek over the years. NYCDEP has collected sediment and surface water data at a limited number of locations in Newtown Creek since 1980 [Ref. 11, pp. 27-28]. Results indicate that metals and various organic chemicals, including polychlorinated biphenyls (PCB) and polycyclic aromatic hydrocarbons (PAH), are present at elevated levels in the creek sediments [Ref. 11, pp. 182-183]. Sediment sampling by Phelps Dodge Refining Corporation (PDRC) from March 2004 to August 2005 showed the presence of copper and zinc at percent levels (i.e., greater than 10,000 milligrams per kilogram [mg/kg]), and PCBs at concentrations up to 106,000 micrograms per kilogram (µg/kg) [Ref. 11, pp. 29-43, 105-113, 1005-1032, 1055-1097]. Other metals, pesticides, and PAHs were also detected above NYSDEC screening criteria [Ref. 11, pp. 60-65, 1005-1032, 1055-1097]. The pattern of contamination indicates that contaminants and pollutants from various sources are intermingled within the Newtown Creek sediments [Ref. 11, pp. 60-65, 138-152].

From February to April 2009, EPA collected sediment samples from Newtown Creek and project-specific background samples from the nearby Atlantic Basin. Surface samples (designated with an “A”) were collected from the 0- to 2-foot depth interval with a modified Van Veen dredge, and subsurface samples (designated with a “B”) were collected at depths ranging from 2 to 6 feet with a vibracore coring device [Ref. 23, pp. 7-70; 25, pp. 6-16, 20-23]. Figures 2 and 3 present the sample locations for Newtown Creek and Atlantic Basin, respectively. The analytical results indicate that metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC) including PAHs, and PCBs are present in the sediments at concentrations significantly above background [see Section 2.4.1]. Calcium, copper, and zinc exceeded one percent (i.e., 10,000 mg/kg) in at least one sample each. The EPA sediment sampling results show that contaminated sediments are located throughout Newtown Creek, from the navigable portion of English Kills (samples NC-SD71A and NC-SD71B) to the East River (samples NC-SD01A and NC-SD01B). The variety and distribution of contaminants suggests that the sediment contamination originated at a variety of sources [Tables 1 and 2, Figures 2 and 3; Ref. 26 through 46 – see Section 2.4.1].

SOURCE:

1. New York State Interactive Mapping Gateway. BrooklynNE_tile0.sid, BrooklynNE_tile1.sid, BrooklynNE_tile2.sid, BrooklynNE_tile3.sid, BrooklynNW_tile0.sid, BrooklynNW_tile1.sid, BrooklynNW_tile2.sid, BrooklynNW_tile3.sid, accessed at http://www1.nysgis.state.ny.us.September 2008.

TITLE:

Figure 1
Site Location Map
Newtown Creek
Brooklyn/Queens, New York

PROJECT:
Expanded Site Inspection Newtown Creek

CLIENT NAME:
U.S. EPA

WESTON SOLUTIONS

DATE:
January 2009

FIGURE #:
1

P:\SAT2\Newtown_Creek\MXD\06716_NTC_Sample_Loc_061509.mxd

Legend

- Surface Sediment Sample Location
- Subsurface Sediment Sample Locations
- Reported Fishing / Crabbing Locations
- Documented Zone of Contamination

NOTE:
1. All Sample IDs preceded by "NC-"
2. Background samples are displayed on Figure 3.

SOURCE:
1. New York State Interactive Mapping Gateway. BrooklynNE_tile0.sid, BrooklynNE_tile1.sid, BrooklynNE_tile2.sid, BrooklynNE_tile3.sid, BrooklynNW_tile0.sid, BrooklynNW_tile1.sid, BrooklynNW_tile2.sid, BrooklynNW_tile3.sid, accessed at http://www1.nysgis.state.ny.us. September 2008.
2. Weston, Site Logbook, Newtown Creek Site, Document Control No. 524-4E-ADGW, February-April 2009.
3. Riverkeeper, Inc. Web Site (www.riverkeeper.org) and written communication. April 2009.

LEGEND:
1,200 600 0 1,200
Graphic Scale In Feet

PROJECT:
Newtown Creek

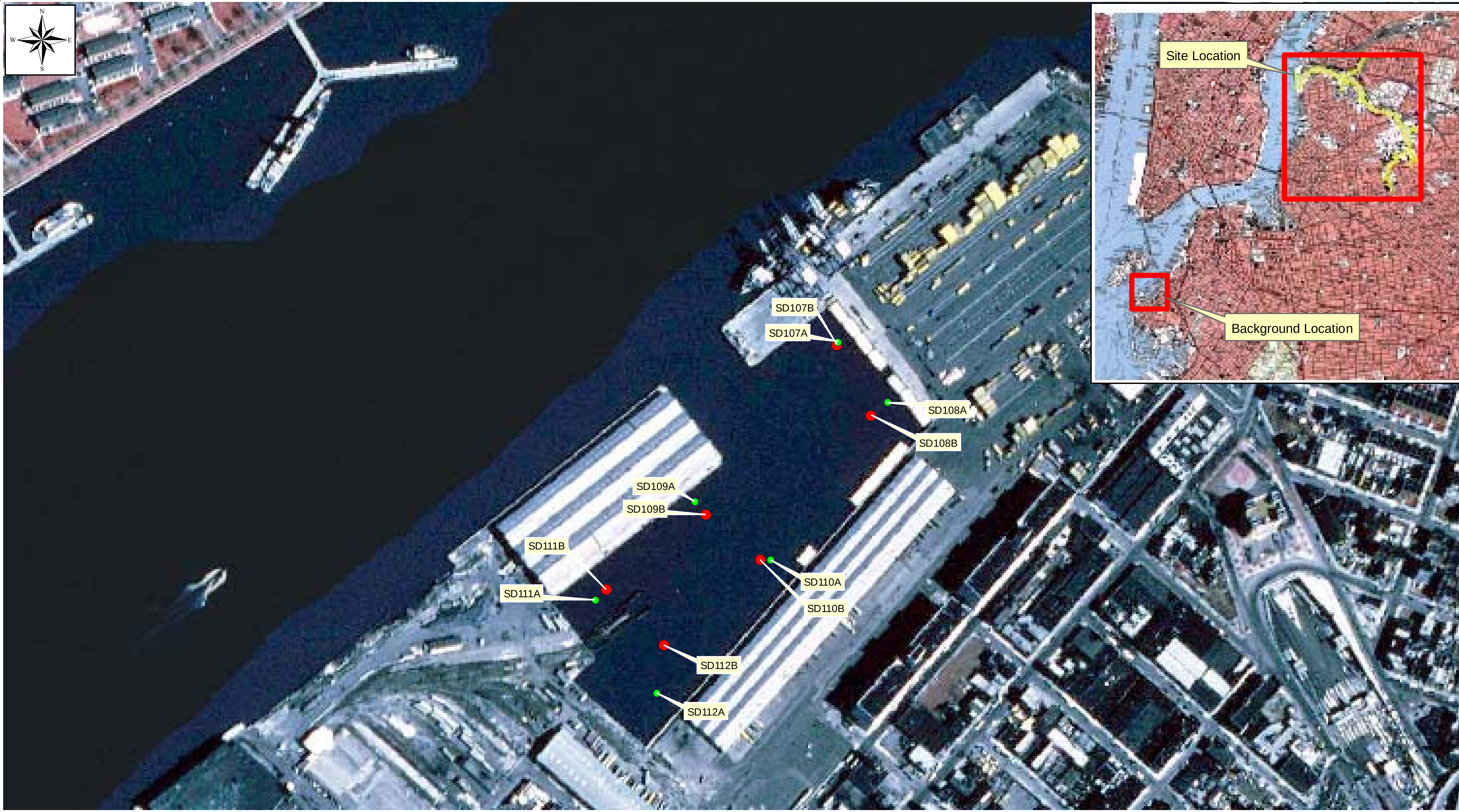
CLIENT NAME:
EPA

TITLE:
Surface and Subsurface Sediment
Sample Location Map
February – April 2009
Newtown Creek, Brooklyn / Queens, New York

WESTON SOLUTIONS SM

DATE:
June 2009

FIGURE #:
2



NOTE:
1. All Sample IDs preceded by "NC-"

SOURCES:
1. New York State Interactive Mapping Gateway. Jersey_CitySE_tile1.sid,accessed at http://www1.nysgis.state.ny.us. September 2008.
2. National Geographic TOPO! U.S. Geologic Survey (USGS). 7.5 Minute Series (Topographic) Quadrangles: Brooklyn, NY, 1995; Central Park, NY, 1995; Jersey City, NJ, 1976 revised 1981; and Weehawken, NJ 1995.
3. Weston, Site Logbook, Newtown Creek Site, Document Control No. 524-4E-ADGW, February-April 2009.

300 150 0 300
Graphic Scale In Feet

LEGEND:
- Surface Sediment Sample Location
- Subsurface Sediment Sample Locations

PROJECT: Newtown Creek

CLIENT NAME: EPA

TITLE:
Background Surface Sediment Sample Location Map
March 2009
Atlantic Basin, Brooklyn, New York

WESTON SOLUTIONS SM

DATE: June 2009

FIGURE #: 3

P:/SAT2/Newtown_Creek/MXD/06717_NTC_BKG_Sample_Loc_061509.mxd

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: Source No. 1

Name and description of the source: Newtown Creek contaminated sediments

Source Type: Other (contaminated sediments with no identified source)

Source 1 consists of contaminated sediments in Newtown Creek. There are several hazardous substances affecting the creek sediments, including metals, VOCs, SVOCs, and PCBs [see Section 2.4.1]. The origin of these hazardous substances in the contaminated sediments has not been identified due to the presence of multiple possible sources for each substance. As a result, the source(s) of all the contamination in any particular location in the creek cannot be determined. The upland areas adjacent to this source have been heavily industrialized since the 1850s. Historical or current industrial activities along and within the creek have included oil refining, storage, and distribution; copper smelting; waste oil, scrap metal, soil, and concrete recycling; petrochemical, chemical, paint, fertilizer, glue, and dry ice manufacture; energy production at MGPs and natural gas facilities; shipbuilding and aluminum manufacture for airplanes; cement and lumber production and storage; coal yards; fat rendering, hide tanning, sugar refining, and canning; and transport of fuel, raw materials, and products [Ref. 7, pp. 1, 3, 7, 13; 8, p. 10; 9, pp. 4-6; 11, pp. 12-16; 13, pp. 1-5; 14, pp. 7-8; 16, p. 3; 17, p. 5; 18, pp. 6, 11-12]. In addition, discharge of raw sewage directly into the water occurred from 1865 to 1967. Although there have been upgrades to the Newtown Creek WPCP, the creek is still the receiving water body for industrial discharges, CSO discharges, and storm water from the surrounding neighborhoods [Ref. 6, p. 1; 8, p. 10; 9, pp. 5, 8; 11, pp. 11, 20-22, 103; 12, pp. 21-22, 96-102; 20, pp. 2-3].

Numerous past investigations with varying scopes have been conducted within and around Newtown Creek, with most of the focus on specific properties or specific segments of the creek [Ref. 8, pp. 15-21; 11, pp. 7, 97, 104-113; 14, pp. 5-18, 38-40; 16, pp. 2-4; 17, pp. 4, 33-34; 18, pp. 13-14, 51; 19, pp. 1-3]. Some of these studies have shown the presence of various contaminants at elevated levels in the creek sediments. Historical NYCDEP sediment sampling data indicate high concentrations of metals, VOCs, SVOCs, and PCBs [Ref. 11, pp. 27-28, 180-183]. Sediment sampling by PDRC from March 2004 to August 2005 showed percent levels (i.e., greater than 10,000 mg/kg) of copper and zinc, and PCBs up to 106,000 µg/kg [Ref. 11, pp. 29-43, 105-113, 1005-1032, 1055-1097]. Other metals, pesticides, and PAHs were also detected above NYSDEC screening criteria [Ref. 11, pp. 60-65, 1005-1032, 1055-1097]. The pattern of contamination indicates that contaminants and pollutants from various sources are intermingled within the Newtown Creek sediments [Ref. 11, pp. 60-65, 138-152].

From February to April 2009, EPA collected sediment samples from Newtown Creek and project-specific background samples from the nearby Atlantic Basin. Surface samples (designated with an “A”) were collected from the 0- to 2-foot depth interval with a modified Van Veen dredge, and subsurface samples (designated with a “B”) were collected at depths ranging from 2 to 6 feet with a vibracore coring device [Ref. 23, pp. 7-70; 25, pp. 4, 6-16, 20-23]. The samples were analyzed for Target Compound List (TCL) VOCs, SVOCs, and PCBs; Target Analyte List (TAL) metals; total organic carbon (TOC); and grain-size distribution [Ref. 25, pp. 1-5]. The analytical results indicate that metals, VOCs, SVOCs including PAHs, and PCBs are present in the Newtown Creek sediments at concentrations that meet the criteria for observed release [see Section 2.4.1]. These contaminants may have entered Newtown Creek via several transport pathways or mechanisms, including spillage, direct disposal or discharge, contaminated ground water discharge, or storm water runoff [Ref. 9, pp. 4, 6; 11, pp. 20-24; 12, pp. 21-22]. The variety and distribution of contaminants suggest that the sediment contamination originated at a variety of sources [Tables 1 and 2, Figures 2 and 3; Ref. 26 through 46 – see Section 2.4.1].

Location of the source, with reference to a map of the site:

The EPA sampling results using observed release criteria show that contaminated sediments are located throughout Newtown Creek, from the navigable portion of English Kills (samples NC-SD71A and NC-SD71B) to the East River (samples NC-SD01A and NC-SD01B). The sample locations are shown in Figure 2.

Containment

Release to surface water via overland migration and/or flood:

The presence of contaminated sediments provides evidence that a variety of hazardous substances (metals, VOCs, PAHs, and PCBs) have migrated into Newtown Creek from numerous sources. Sediment core logs indicate that neither of the following is present: (1) maintained engineered cover, or (2) functioning and maintained run-on control system and runoff management system [Ref. 24, pp. 1-137]. Therefore, a surface water containment factor value of 10 is assigned for this source [Ref. 1, p. 51609, Table 4-2].

2.4.1 Hazardous Substances

Sampling and analysis by EPA from February to April 2009 showed the presence of several contaminants in Newtown Creek sediments at concentrations significantly above background concentrations. Tables 1 and 2 show information for the samples that document background concentrations and observed release, while Tables 3 and 4 present the analytical results for the substances that meet observed release criteria.

Notes on Sample Similarity:

Since the contamination begins at the head of the creek, it was not possible to obtain upstream samples. Therefore, samples collected from a nearby similar water body, Atlantic Basin, were used to establish background concentrations. Figure 3 provides the map of the background sample locations in the Atlantic Basin. The background samples from Atlantic Basin and contaminated samples from Newtown Creek were handled the same procedurally and were similar physically, as follows:

- Sampling Methods: The background and release sediment samples were all collected by EPA, using Standard Operating Procedures (SOP), during the sampling event from February-April 2009. Surface samples were collected with a Young-modified Van Veen dredge, and subsurface samples were collected with a vibracore [Ref. 23, pp. 7-70; 25, pp. 4, 6-16, 22-23].
- Analytical Procedures: The background and release samples were all analyzed for TAL metals by ChemTech Consulting Group of Mountainside, New Jersey and for TCL VOCs, SVOCs, and PCBs by DataChem Laboratories of Salt Lake City, Utah [Ref. 25, pp. 25-132]. The chemical analyses were coordinated through the Contract Laboratory Program (CLP), and EPA validated the analytical results according to Region 2 Data Validation guidelines [Ref. 26 through 46]. The samples were also analyzed for grain-size distribution according to EPA SOP Bio 8.2 (Bucket Method) and for TOC according to EPA SOP C-88 (Combustion/IR Method) at the EPA laboratory in Edison, New Jersey [Ref. 25, pp. 1-3; 47, pp. 1-55; 48, pp. 1-42; 74, pp. 1-9; 75, pp. 1-14].
- Physical Setting: The Newtown Creek and Atlantic Basin are both part of the same estuary (i.e., the New York-New Jersey Harbor Estuary) and are classified under the HRS as “Coastal tidal waters”, in which flow and depth characteristics are not considered to be applicable for the evaluation [Ref. 1, pp. 51605, 51613; 10, pp. 6-7].
- Sampling Depth: Background and release surface samples were all collected from the 0- to 2-foot interval below top of sediment, while background and release subsurface samples were collected at depths ranging from 2 to 6 feet below top of sediment (EPA evaluated surface and subsurface samples separately) [Ref. 25, pp. 6-16]. The height of the water column ranged from 14 to 24 feet for background locations and 7 to 23 feet for release locations [Ref. 24, pp. 1-137].
- Percent Moisture (based on Inorganic sample fraction): The percent moisture in the background samples ranged from approximately 61% to 71%, while percent moisture in the release samples ranged from approximately 30% to 82% [Ref. 26, pp. 6-14; 27, pp. 3, 19-38; 28, pp. 3-22, 36-44; 29, pp. 3-23, 31-50; 30, pp. 5-12; 37, pp. 5-13; 38, pp. 5-17; 41, pp. 5-18; 42, pp. 2-15; 43, pp. 5-22].
- Sample Description: Visual descriptions from core logs show that the sediments within Atlantic Basin and Newtown Creek consist predominantly of “soft muck” [Ref. 24, pp. 1-137]. Grain-size analyses show that most of the samples contain high percentages of fine-grained material (i.e., clay and silt), with the background samples showing the highest percentages of fines and lowest percentages of sand. Since many contaminants have a greater affinity for clay and silt than for sand, the reported background concentrations might be skewed high with respect to release concentrations [Ref. 47, pp. 2-54; 49, p. 6]. EPA considers this type of comparison to be a conservative one (i.e., higher scrutiny for data to meet observed release criteria).
- Total Organic Carbon: The analytical results indicate that TOC levels are higher in the Newtown Creek sediments than in the Atlantic Basin sediments [Ref. 48, pp. 1-42]. EPA considers this to be further indication that anthropogenic contributions (e.g., CSOs) have affected Newtown Creek more than Atlantic Basin, and that hazardous substance concentrations in Atlantic Basin are indicative of background conditions.

Due to the similarities (i.e., same time frame, same sampling and analytical methods, same laboratories, similar physical setting and sampling depths, overlapping ranges of percent moisture values, and similar sediment descriptions) among the background samples from Atlantic Basin and release samples from Newtown Creek, the background and release analytical results are considered to be comparable. EPA evaluated surface and subsurface samples separately, comparing observed release concentrations to the maximum background concentrations within each data set.

The following criteria from the HRS were used to evaluate significance above background (i.e., observed release):

- If the maximum background concentration is not detected or is less than the detection limit, an observed release is established when the sample measurement equals or exceeds the SQL [Ref. 1, p. 51589].
- If the maximum background concentration equals or exceeds the detection limit, an observed release is established when the sample measurement equals or exceeds the SQL and is three times or more above the background concentration [Ref. 1, p. 51589].
- Numerous results are qualified as estimated (“J”) with no direction of bias specified [Tables 3 and 4; Ref. 26 through 46]. For the J-flagged background results, EPA used adjustment factors presented in the Fact Sheet “Using Qualified Data to Document an Observed Release and Observed Contamination” to complete the background-release comparison, thereby compensating for probable uncertainty in the analyses [Ref. 50, pp. 1-18]. EPA took the most conservative approach to screening the data (i.e., the highest scrutiny for data to meet observed release criteria) by assuming all estimated concentrations to be of unknown bias [Tables 3 and 4].

Notes on Tables 3 and 4:

Italics denote the maximum background concentration for each hazardous substance.
Bold indicates concentrations that meet the criteria for observed release.
Blank spaces indicate that the results do not meet observed release criteria.

Explanation of columns under the heading “Guidance Criteria”:

CRQL – Contract Required Quantitation Limit

Maximum Background – this column presents the maximum background concentration for each hazardous substance, or the maximum background SQL if substance not detected.

Adjustment Factor – this column presents the specific or default adjustment factor for each hazardous substance, as presented in the EPA Fact Sheet “Using Qualified Data to Document an Observed Release and Observed Contamination”.

Adjusted Background – this column presents the maximum background concentrations after the adjustment factors have been applied (adjustment factors were not applied to maximum SQLs for non-detected substances).

Adjusted Background x3 (non-J must exceed) – this column presents the minimum concentrations required to document observed release for release results that are not flagged as estimated. The adjusted background concentrations are multiplied by three, except in the case of non-detected substances, where the maximum SQL is presented.

Adjusted Background x3 x Adjustment Factor (J must exceed) – this column presents the minimum concentrations required to document an observed release for J-flagged release data. The minimum concentrations for non-J results are adjusted upward a second time to compensate for probable uncertainty in the analyses. (Note that this is a simple inversion of the procedure suggested in the Fact Sheet).

Explanation of the Comments row: MS/MSD means matrix spike/matrix spike duplicate; Dup. means duplicate of the sample specified.

Table 1
Background and Observed Release Sample Information
Surface Samples - February 2009
Newtown Creek, Brooklyn/Queens, NY

Field Location	Inorganic CLP No.	Organic CLP No.	Sample Date	Sample Time	Height of Water Column (ft)	Depth (ft) [below top of sediment]	Moisture (%) *	Sand (%)	Silt (%)	Clay (%)	TOC (mg/kg)	References
BACKGROUND												
NC-SD107A	MB5E77	B5E77	2/27/2009	1250	14	0-2	67.8	4.0	51.3	44.7	38,000	23, p. 26; 24, p. 76; 25, p. 15; 29, p. 92; 47, p. 20; 48, p. 16
NC-SD108A	MB5E79	B5E79	2/27/2009	1240	17	0-2	66.9	3.3	52.3	44.5	36,000	23, p. 26; 24, p. 75; 25, p. 16; 29, p. 93; 47, p. 21; 48, p. 16
NC-SD109A	MB5E81	B5E81	2/27/2009	1310	23	0-2	68.2	1.6	63.8	34.7	37,000	24, p. 78; 25, p. 16; 29, p. 93; 47, p. 21; 48, p. 16
NC-SD110A	MB5E83	B5E83	2/27/2009	1300	23	0-2	68.3	1.7	62.4	35.9	37,000	23, p. 26; 24, p. 77; 25, p. 16; 29, p. 94; 47, p. 21; 48, p. 16
NC-SD111A	MB5E85	B5E85	2/27/2009	1330	23	0-2	69.5	1.7	74.7	23.6	32,000	23, p. 27; 24, p. 80; 25, p. 16; 29, p. 94; 47, p. 22; 48, p. 17
NC-SD112A	MB5E87	B5E87	2/27/2009	1320	22	0-2	69.1	2.0	69.8	28.2	33,000	23, p. 27; 24, p. 79; 25, p. 16; 29, p. 95; 47, p. 22; 48, p. 17
RELEASE												
NC-SD01A	MB5DJ5	B5DJ5	2/11/2009	1200	23	0-2	59.9	29.8	45.9	24.2	110,000	23, p. 9; 24, p. 2; 25, p. 6; 26, p. 15; 47, p. 2; 48, p. 2
NC-SD03A	MB5DJ9	B5DJ9	2/11/2009	1315	20	0-2	54.3	53.4	35.0	11.6	50,000	23, p. 9; 24, p. 3; 25, p. 6; 26, p. 19; 47, p. 3; 48, p. 3
NC-SD21A	MB5DN5	B5DN5	2/25/2009	0945	20	0-2	62.8	32.3	46.8	20.9	55,000	23, p. 19; 24, p. 23; 25, p. 8; 28, p. 63; 47, p. 17; 48, p. 13
NC-SD22A	MB5DN7	B5DN7	2/25/2009	0930	23	0-2	63.1	24.0	49.3	26.7	50,000	23, p. 18; 24, p. 22; 25, p. 8; 28, p. 65; 47, p. 17; 48, p. 13
NC-SD23A	MB5DN9	B5DN9	2/25/2009	1050	15	0-2	67.6	18.0	50.0	32.0	52,000	23, p. 19; 24, p. 26; 25, p. 8; 28, p. 66; 47, p. 17; 48, p. 13
NC-SD24A	MB5DP1	B5DP1	2/25/2009	1110	22	0-2	64.8	21.5	47.6	30.9	49,000	23, p. 19; 24, p. 27; 25, p. 9; 28, p. 67; 47, p. 18; 48, p. 14
NC-SD25A	MB5DP3	B5DP3	2/25/2009	1120	14	0-2	62.0	33.3	44.1	22.6	100,000	23, p. 19; 24, p. 28; 25, p. 9; 28, p. 67; 47, p. 18; 48, p. 14
NC-SD26A	MB5DP5	B5DP5	2/25/2009	1130	16	0-2	46.9	76.5	17.4	6.1	54,000	23, p. 19; 24, p. 29; 25, p. 9; 28, p. 68; 47, p. 18; 48, p. 14
NC-SD27A	MB5DP7	B5DP7	2/25/2009	1140	15	0-2	64.9	22.3	52.9	24.8	59,000	23, p. 19; 24, p. 30; 25, p. 9; 28, p. 69; 47, p. 19; 48, p. 14
NC-SD28A	MB5DP9	B5DP9	2/25/2009	1200	19	0-2	63.1	36.4	43.8	19.9	70,000	23, p. 19; 24, p. 31; 25, p. 9; 28, p. 69; 47, p. 11; 48, p. 8
NC-SD29A	MB5DQ1	B5DQ1	2/25/2009	1320	14	0-2	66.7	26.4	48.5	25.1	61,000	23, p. 19; 24, p. 33; 25, p. 9; 28, p. 70; 47, p. 11; 48, p. 9
NC-SD30A	MB5DQ3	B5DQ3	2/25/2009	1245	15	0-2	63.2	36.7	38.5	24.9	61,000	23, p. 19; 24, p. 32; 25, p. 9; 28, p. 70; 47, p. 11; 48, p. 9
NC-SD31A	MB5DQ5	B5DQ5	2/25/2009	1345	15	0-2	68.3	18.9	54.7	26.4	59,000	23, p. 19; 24, p. 35; 25, p. 10; 28, p. 71; 47, p. 12; 48, p. 9
NC-SD32A	MB5DQ7	B5DQ7	2/25/2009	1330	10	0-2	68.3	24.8	50.3	25.0	59,000	23, p. 19; 24, p. 34; 25, p. 10; 28, p. 72; 47, p. 12; 48, p. 9
NC-SD33A	MB5DQ9	B5DQ9	2/25/2009	1410	14	0-2	67.9	18.2	47.9	33.9	56,000	23, p. 19; 24, p. 37; 25, p. 10; 28, p. 72; 47, p. 12; 48, p. 10
NC-SD34A	MB5DR1	B5DR1	2/25/2009	1400	13	0-2	69.5	17.5	51.4	31.2	56,000	23, p. 19; 24, p. 36; 25, p. 10; 28, p. 74; 47, p. 13; 48, p. 10
NC-SD35A	MB5DR3	B5DR3	2/25/2009	1435	15	0-2	29.9	72.5	19.9	7.6	70,000	23, p. 19; 24, p. 39; 25, p. 10; 28, p. 74; 47, p. 13; 48, p. 10
NC-SD36A	MB5DR5	B5DR5	2/25/2009	1420	10	0-2	68.9	23.9	58.3	17.8	68,000	23, p. 19; 24, p. 38; 25, p. 10; 28, p. 75; 47, p. 13; 48, p. 10
NC-SD37A	MB5DR7	B5DR7	2/25/2009	1450	11	0-2	72.4	21.0	50.1	28.9	65,000	23, p. 19; 24, p. 40; 25, p. 10; 28, p. 76; 47, p. 14; 48, p. 11
NC-SD38A	MB5DR9	B5DR9	2/25/2009	1500	8.5	0-2	70.9	26.3	50.6	23.1	66,000	23, p. 20; 24, p. 41; 25, p. 10; 28, p. 76; 47, p. 14; 48, p. 11
NC-SD39A	MB5DS1	B5DS1	2/26/2009	0830	16	0-2	69.1	15.8	57.3	26.9	65,000	23, p. 21; 24, p. 42; 25, p. 10; 29, p. 64; 47, p. 28; 48, p. 21
NC-SD40A	MB5DS3	B5DS3	2/26/2009	0840	14	0-2	70.3	22.5	53.1	24.4	75,000	23, p. 21; 24, p. 43; 25, p. 11; 29, p. 64; 47, p. 28; 48, p. 21
NC-SD41A	MB5DS5	B5DS5	2/26/2009	0850	14	0-2	67.9	20.5	52.3	27.2	67,000	23, p. 21; 24, p. 44; 25, p. 11; 29, p. 65; 47, p. 28; 48, p. 22
NC-SD42A	MB5DS7	B5DS7	2/26/2009	0900	13	0-2	73.5	22.0	54.5	23.5	68,000	23, p. 21; 24, p. 45; 25, p. 11; 29, p. 67; 47, p. 29; 48, p. 22
NC-SD43A	MB5DS9	B5DS9	2/26/2009	0910	13	0-2	68.6	21.0	50.0	29.0	62,000	23, p. 21; 24, p. 46; 25, p. 11; 29, p. 68; 47, p. 29; 48, p. 22
NC-SD44A	MB5DT1	B5DT1	2/26/2009	0920	13	0-2	71.0	29.3	42.9	27.8	74,000	23, p. 21; 24, p. 47; 25, p. 11; 29, p. 69; 47, p. 29; 48, p. 22
NC-SD45A	MB5DT3	B5DT3	2/26/2009	0935	16	0-2	67.7	19.1	50.3	30.6	69,000	23, p. 21; 24, p. 48; 25, p. 11; 29, p. 69; 47, p. 30; 48, p. 23
NC-SD46A	MB5DT5	B5DT5	2/26/2009	0945	11	0-2	69.2	27.2	46.1	26.8	75,000	23, p. 21; 24, p. 49; 25, p. 11; 29, p. 70; 47, p. 30; 48, p. 23
NC-SD47A	MB5DT7	B5DT7	2/26/2009	0955	15	0-2	65.4	31.4	47.2	21.3	80,000	23, p. 21; 24, p. 50; 25, p. 11; 29, p. 71; 47, p. 30; 48, p. 23
NC-SD48A	MB5DT9	B5DT9	2/26/2009	1010	14	0-2	67.2	32.0	46.7	21.3	80,000	23, p. 21; 24, p. 51; 25, p. 11; 29, p. 72; 47, p. 31; 48, p. 23
NC-SD49A	MB5DW1	B5DW1	2/26/2009	1125	15	0-2	68.2	28.0	42.7	29.3	83,000	23, p. 22; 24, p. 53; 25, p. 12; 29, p. 73; 47, p. 31; 48, p. 24
NC-SD50A	MB5DW3	B5DW3	2/26/2009	1025	14	0-2	57.6	42.9	35.1	22.0	66,000	23, p. 22; 24, p. 52; 25, p. 12; 29, p. 73; 47, p. 31; 48, p. 24
NC-SD51A	MB5DW5	B5DW5	2/26/2009	1155	19	0-2	74.7	16.5	41.5	41.9	110,000	23, p. 22; 24, p. 55; 25, p. 12; 29, p. 74; 47, p. 32; 48, p. 24
NC-SD52A	MB5DW7	B5DW7	2/26/2009	1140	18	0-2	74.9	16.4	45.9	37.7	89,000	23, p. 22; 24, p. 54; 25, p. 12; 29, p. 74; 47, p. 32; 48, p. 24
NC-SD53A	MB5DW9	B5DW9	2/26/2009	1215	17	0-2	71.9	7.6	42.8	49.6	140,000	23, p. 22; 24, p. 57; 25, p. 12; 29, p. 75; 47, p. 32; 48, p. 25
NC-SD54A	MB5DX1	B5DX1	2/26/2009	1205	12	0-2	74.5	17.4	54.1	28.5	120,000	23, p. 22; 24, p. 56; 25, p. 12; 29, p. 75; 47, p. 33; 48, p. 25
NC-SD55A	MB5DX3	B5DX3	2/26/2009	1240	14	0-2	76.8	8.8	50.6	40.6	100,000	23, p. 23; 24, p. 59; 25, p. 12; 29, p. 76; 47, p. 33; 48, p. 25
NC-SD56A	MB5DX5	B5DX5	2/26/2009	1225	10	0-2	76.5	12.0	51.6	36.4	99,000	23, p. 22; 24, p. 58; 25, p. 12; 29, p. 77; 47, p. 33; 48, p. 25
NC-SD57A	MB5DX7	B5DX7	2/27/2009	0830	14	0-2	81.8	10.0	54.5	35.5	94,000	23, p. 25; 24, p. 61; 25, p. 13; 29, p. 77; 47, p. 22; 48, p. 17
NC-SD93A	MB5E49	B5E49					82.3	11.5	51.9	36.6	91,000	23, p. 25; 24, p. 61; 25, p. 15; 29, p. 91; 47, p. 27; 48, p. 21
NC-SD58A	MB5DX9	B5DX9	2/26/2009	1255	11	0-2	79.6	10.3	58.3	31.4	100,000	23, p. 23; 24, p. 60; 25, p. 13; 29, p. 78; 47, p. 34; 48, p. 26
NC-SD59A	MB5DY1	B5DY1	2/27/2009	0855	15	0-2	80.3	14.1	54.9	31.1	99,000	23, p. 25; 24, p. 63; 25, p. 13; 29, p. 81; 47, p. 23; 48, p. 17
NC-SD60A	MB5DY3	B5DY3	2/27/2009	0845	14	0-2	78.3	18.5	51.8	29.7	96,000	23, p. 25; 24, p. 62; 25, p. 13; 29, p. 82; 47, p. 23; 48, p. 18
NC-SD61A	MB5DY5	B5DY5	2/27/2009	0940	13	0-2	80.0	91.1	5.3	3.6	94,000	23, p. 25; 24, p. 65; 25, p. 13; 29, p. 82; 47, p. 23; 48, p. 18
NC-SD62A	MB5DY7	B5DY7	2/27/2009	0930	16	0-2	33.0	92.1	3.7	4.2	140,000	23, p. 25; 24, p. 64; 25, p. 13; 29, p. 85; 47, p. 24; 48, p. 18
NC-SD63A	MB5DY9	B5DY9	2/27/2009	1005	10	0-2	78.0	23.1	50.4	26.4	110,000	23, p. 25; 24, p. 67; 25, p. 13; 29, p. 85; 47, p. 24; 48, p. 18
NC-SD64A	MB5DZ1	B5DZ1	2/27/2009	0955	12	0-2	50.4	80.7	12.7	6.6	70,000	23, p. 25; 24, p. 66; 25, p. 13; 29, p. 86; 47, p. 24; 48, p. 19
NC-SD65A	MB5DZ3	B5DZ3	2/27/2009	1025	16	0-2	79.2	14.0	58.5	27.5	90,000	23, p. 26; 24, p. 69; 25, p. 13; 29, p. 87; 47, p. 25; 48, p. 19
NC-SD66A	MB5DZ5	B5DZ5	2/27/2009	1015	9.8	0-2	73.5	35.1	44.2	20.7	77,000	23, p. 25; 24, p. 68; 25, p. 14; 29, p. 87; 47, p. 25; 48, p. 19
NC-SD67A	MB5DZ7	B5DZ7	2/27/2009	1040	16	0-2	67.4	38.2	29.6	32.2	82,000	23, p. 26; 24, p. 70; 25, p. 14; 29, p. 88; 47, p. 25; 48, p. 19
NC-SD68A	MB5DZ9	B5DZ9	2/27/2009	1050	18	0-2	67.0	44.8	31.5	23.7	100,000	23, p. 26; 24, p. 71; 25, p. 14; 29, p. 88; 47, p. 26; 48, p. 20
NC-SD69A	MB5E01	B5E01	2/27/2009	1100	17	0-2	74.8	34.4	28.8	36.8	150,000	23, p. 26; 24, p. 72; 25, p. 14; 29, p. 89; 47, p. 26; 48, p. 20
NC-SD94A	MB5E51	B5E51					73.8	35.4	36.5	28.1	140,000	23, p. 26; 24, p. 72; 25, p. 15; 29, p. 91; 47, p. 27; 48, p. 21
NC-SD70A	MB5E03	B5E03	2/27/2009	1115	18	0-2	69.1	29.9	37.7	32.4	140,000	23, p. 26; 24, p. 73; 25, p. 14; 29, p. 90; 47, p. 26; 48, p. 20
NC-SD71A	MB5E05	B5E05	2/27/2009	1125	18	0-2	69.7	23.6	38.6	37.7	190,000	23, p. 26; 24, p. 74; 25, p. 14; 29, p. 90; 47, p. 27; 48, p. 20
NC-SD74A	MB5E11	B5E11	2/25/2009	0920	16	0-2	66.0	15.1	51.0	33.9	52,000	23, p. 18; 24, p. 21; 25, p. 14; 28, p. 77; 47, p. 19; 48, p. 15
NC-SD75A	MB5E13	B5E13	2/25/2009	0955	18	0-2	68.0	20.0	46.5	33.5	53,000	23, p. 19; 24, p. 24; 25, p. 14; 28, p. 77; 47, p. 19; 48, p. 15
NC-SD76A	MB5E15	B5E15	2/25/2009	1005	8	0-2	77.4	13.7	45.0	41.3	83,000	23, p. 19; 24, p. 25; 25, p. 15; 28, p. 78; 47, p. 20; 48, p. 15

* The percent moisture as reported for the inorganics fraction.
ft = feet
mg/kg = milligrams per kilogram

Table 2
Background and Observed Release Sample Information
Subsurface Samples - February to April 2009
Newtown Creek, Brooklyn/Queens, NY

Field Location	Inorganic CLP No.	Organic CLP No.	Sample Date	Sample Time	Height of Water Column (ft)	Depth (ft) [below top of sediment]	Moisture (%) *	Sand (%)	Silt (%)	Clay (%)	TOC (mg/kg)	References
BACKGROUND												
NC-SD107B	MB5E78	B5E78	3/10/2009	1018	17	4-6	63.7	7.0	64.5	28.5	40,000	23, p. 33; 24, p. 81; 25, p. 15; 36, p. 14; 47, p. 34; 48, p. 26
NC-SD108B	MB5E80	B5E80	3/10/2009	1110	20	4-5	64.0	3.2	67.5	29.3	34,000	23, p. 33; 24, p. 82; 25, p. 16; 36, p. 16; 47, p. 34; 48, p. 26
NC-SD109B	MB5E82	B5E82	3/10/2009	1135	23	4-6	63.4	2.4	61.5	36.1	36,000	23, p. 33; 24, p. 83; 25, p. 16; 36, p. 17; 47, p. 35; 48, p. 26
NC-SD110B	MB5E84	B5E84	3/10/2009	1255	NM	4-6	65.1	2.5	67.8	29.7	34,000	23, p. 33; 24, p. 84; 25, p. 16; 36, p. 18; 47, p. 35; 48, p. 27
NC-SD111B	MB5E86	B5E86	3/10/2009	1345	18	4-6	63.2	1.5	61.0	37.5	43,000	23, p. 33; 24, p. 85; 25, p. 16; 36, p. 18; 47, p. 35; 48, p. 27
NC-SD112B	MB5E88	B5E88	3/10/2009	1420	16	4-5.5	67.0	1.9	64.1	33.9	37,000	23, p. 33; 24, p. 86; 25, p. 16; 36, p. 19; 47, p. 36; 48, p. 27
RELEASE												
NC-SD01B	MB5DJ6	B5DJ6	2/11/2009	1250	23	3.5-4	63.2	16.7	56.0	27.3	55,000	23, p. 9; 24, p. 2; 25, p. 6; 26, p. 10; 47, p. 2; 48, p. 2
NC-SD07B	MB5DK8	B5DK8	2/17/2009	1212	15	4-6	63.3	9.5	61.0	29.5	56,000	23, p. 12; 24, p. 7; 25, p. 6; 27, p. 26; 47, p. 6; 48, p. 5
NC-SD08B	MB5DL0	B5DL0	2/17/2009	1325	14	4-6	62.1	5.7	62.5	31.7	51,000	23, p. 12; 24, p. 8; 25, p. 7; 27, p. 28; 47, p. 7; 48, p. 5
NC-SD09B	MB5DL2	B5DL2	2/17/2009	1430	13	4-5.75	58.2	18.1	43.4	38.4	100,000	23, p. 12; 24, p. 9; 25, p. 7; 27, p. 30; 47, p. 7; 48, p. 6
NC-SD10B	MB5DL4	B5DL4	2/17/2009	1530	12	4-4.8	60.5	18.6	54.9	26.6	84,000	23, p. 13; 24, p. 10; 25, p. 7; 27, p. 32; 47, p. 8; 48, p. 6
NC-SD13B	MB5DM0	B5DM0	2/18/2009	0955	10	4-5.8	47.0	64.2	20.5	15.3	65,000 J	23, p. 15; 24, p. 13; 25, p. 7; 27, p. 37; 47, p. 10; 48, p. 8
NC-SD14B	MB5DM2	B5DM2	3/13/2009	1010	12	4-4.5	63.9	14.1	58.2	27.8	67,000	23, p. 37; 24, p. 88; 25, p. 7; 37, p. 16; 47, p. 36; 48, p. 28
NC-SD15B	MB5DM4	B5DM4	3/19/2009	0950	20	4-5.5	56.1	30.6	39.2	30.1	100,000 J	23, p. 50; 24, p. 105; 25, p. 7; 38, p. 18; 47, p. 42; 48, p. 32
NC-SD17B	MB5DM8	B5DM8	3/13/2009	1400	15	4-5	65.0	11.8	57.1	31.1	66,000	23, p. 38; 24, p. 91; 25, p. 8; 37, p. 17; 47, p. 37; 48, p. 28
NC-SD18B	MB5DN0	B5DN0	3/13/2009	1310	18	4-6	64.7	9.6	56.7	33.7	64,000	23, p. 38; 24, p. 90; 25, p. 8; 37, p. 18; 47, p. 37; 48, p. 28
NC-SD19B	MB5DN2	B5DN2	3/13/2009	1435	13	4-6	51.5	42.7	27.2	30.1	80,000	23, p. 38; 24, p. 92; 25, p. 8; 37, p. 19; 47, p. 38; 48, p. 29
NC-SD20B	MB5DN4	B5DN4	3/16/2009	0910	19	4-5	63.0	43.9	28.5	27.6	58,000	23, p. 40; 24, p. 93; 25, p. 8; 42, p. 20; 47, p. 38; 48, p. 29
NC-SD21B	MB5DN6	B5DN6	3/16/2009	1305	18	4-5	59.8	12.9	43.3	43.9	80,000	23, p. 41; 24, p. 96; 25, p. 8; 42, p. 23; 47, p. 38; 48, p. 29
NC-SD22B	MB5DN8	B5DN8	3/16/2009	1440	23	4-5	59.9	32.3	35.1	32.6	88,000	23, p. 41; 24, p. 98; 25, p. 8; 42, p. 23; 47, p. 39; 48, p. 29
NC-SD23B	MB5DP0	B5DP0	3/17/2009	1145	14	3-3.5	62.5	16.9	50.8	32.3	92,000	23, p. 44; 24, p. 100; 25, p. 9; 42, p. 24; 47, p. 39; 48, p. 30
NC-SD24B	MB5DP2	B5DP2	3/17/2009	1030	24	2-3	49.1	24.7	49.8	25.5	81,000	23, p. 44; 24, p. 99; 42, p. 25; 47, p. 39; 48, p. 30
NC-SD25B	MB5DP4	B5DP4	3/17/2009	1500	17	4-6	51.3	48.8	34.2	17.0	180,000 J	23, p. 46; 24, p. 102; 25, p. 9; 42, p. 26; 47, p. 40; 48, p. 30
NC-SD26B	MB5DP6	B5DP6	3/17/2009	1300	19	3.5-4	52.8	38.1	40.6	21.4	170,000 J	23, p. 45; 24, p. 101; 25, p. 9; 42, p. 26; 47, p. 40; 48, p. 30
NC-SD27B	MB5DP8	B5DP8	3/18/2009	1215	20	2.75-3.25	38.5	47.4	36.0	16.6	78,000 J	23, p. 48; 24, p. 104; 25, p. 9; 38, p. 18; 47, p. 42; 48, p. 32
NC-SD28B	MB5DQ0	B5DQ0	3/18/2009	1100	9	2-3	59.8	31.0	42.7	26.3	100,000 J	23, p. 48; 24, p. 103; 25, p. 9; 38, p. 19; 47, p. 42; 48, p. 32
NC-SD29B	MB5DQ2	B5DQ2	3/19/2009	1210	9.5	4-5.5	56.2	30.6	43.9	25.5	110,000 J	23, p. 50; 24, p. 108; 25, p. 9; 38, p. 20; 47, p. 43; 48, p. 32
NC-SD30B	MB5DQ4	B5DQ4	3/19/2009	1040	19	4-6	58.2	24.5	42.9	32.6	110,000 J	23, p. 50; 24, p. 106; 25, p. 9; 38, p. 20; 47, p. 43; 48, p. 33
NC-SD31B	MB5DQ6	B5DQ6	3/19/2009	1125	13	3.5-4	61.9	36.0	32.6	31.4	97,000 J	23, p. 50; 24, p. 107; 25, p. 10; 38, p. 21; 47, p. 43; 48, p. 33
NC-SD32B	MB5DQ8	B5DQ8	3/19/2009	1320	9.5	3.5-4	59.6	19.6	39.7	40.7	90,000 J	23, p. 50; 24, p. 109; 25, p. 10; 38, p. 23; 47, p. 44; 48, p. 33
NC-SD33B	MB5DR0	B5DR0	3/20/2009	1200	13	3.5-4.5	56.4	38.6	28.3	33.2	80,000 J	23, p. 53; 24, p. 111; 25, p. 10; 38, p. 24; 47, p. 44; 48, p. 33
NC-SD34B	MB5DR2	B5DR2	3/20/2009	1030	19	3.5-4	66.5	27.6	35.0	37.4	76,000 J	23, p. 53; 24, p. 110; 25, p. 10; 38, p. 25; 47, p. 44; 48, p. 34
NC-SD36B	MB5DR6	B5DR6	3/20/2009	1230	17	4-4.5	58.3	41.8	28.9	29.3	86,000 J	23, p. 53; 24, p. 112; 25, p. 10; 38, p. 25; 47, p. 45; 48, p. 34
NC-SD38B	MB5DS0	B5DS0	3/25/2009	1140	20	2-3	64.8	18.7	44.1	37.2	110,000	23, p. 58; 24, p. 113; 25, p. 10; 41, p. 20; 47, p. 45; 48, p. 34
NC-SD39B	MB5DS2	B5DS2	3/25/2009	1245	18	4-5.5	63.8	30.4	40.3	29.3	170,000	23, p. 58; 24, p. 114; 25, p. 11; 41, p. 21; 47, p. 45; 48, p. 34
NC-SD93B	MB5E50	B5E50					60.7	30.5	48.5	20.9	150,000	23, p. 58; 24, p. 114; 25, p. 15; 41, p. 29; 47, p. 48; 48, p. 37
NC-SD42B	MB5DS8	B5DS8	3/25/2009	1315	16	4-6	39.0	67.2	22.6	10.2	100,000	23, p. 58; 24, p. 115; 25, p. 11; 41, p. 22; 47, p. 46; 48, p. 35
NC-SD45B	MB5DT4	B5DT4	3/25/2009	1400	10	4-6	63.1	15.3	57.4	27.3	180,000	23, p. 59; 24, p. 116; 25, p. 11; 41, p. 22; 47, p. 46; 48, p. 35
NC-SD46B	MB5DT6	B5DT6	3/25/2009	1430	12	4-6	58.4	22.4	49.8	27.8	170,000	23, p. 59; 24, p. 117; 25, p. 11; 41, p. 25; 47, p. 46; 48, p. 35
NC-SD47B	MB5DT8	B5DT8	3/25/2009	1500	14	4-5.5	53.2	27.0	41.9	31.1	160,000	23, p. 59; 24, p. 118; 25, p. 11; 41, p. 25; 47, p. 47; 48, p. 35
NC-SD48B	MB5DW0	B5DW0	3/25/2009	1540	14	4-6	62.8	16.0	56.9	27.1	140,000	23, p. 59; 24, p. 119; 25, p. 11; 41, p. 26; 47, p. 47; 48, p. 36
NC-SD49B	MB5DW2	B5DW2	3/31/2009	0935	15	4-6	56.4	28.8	46.5	24.6	220,000	23, p. 64; 24, p. 123; 25, p. 12; 43, p. 24; 47, p. 49; 48, p. 37
NC-SD50B	MB5DW4	B5DW4	3/26/2009	1030	10	3-3.5	59.7	16.5	54.4	29.1	150,000	23, p. 61; 24, p. 120; 25, p. 12; 41, p. 27; 47, p. 47; 48, p. 36
NC-SD51B	MB5DW6	B5DW6	3/31/2009	1025	23	4-6	64.5	16.5	41.3	42.2	170,000	23, p. 65; 24, p. 124; 25, p. 12; 43, p. 25; 47, p. 49; 48, p. 37
NC-SD52B	MB5DW8	B5DW8	3/26/2009	1140	10	4-5.5	64.1	12.3	47.7	40.0	160,000	23, p. 62; 24, p. 121; 25, p. 12; 41, p. 28; 47, p. 48; 48, p. 36
NC-SD53B	MB5DX0	B5DX0	3/31/2009	1055	20	4-5.5	57.9	27.2	33.8	38.9	150,000	23, p. 65; 24, p. 125; 25, p. 12; 43, p. 27; 47, p. 49; 48, p. 37
NC-SD54B	MB5DX2	B5DX2	3/26/2009	1250	10	4-5.5	63.3	23.2	48.7	28.1	180,000	23, p. 62; 24, p. 122; 25, p. 12; 41, p. 28; 47, p. 48; 48, p. 36
NC-SD55B	MB5DX4	B5DX4	3/31/2009	1140	16	4-6	62.6	9.5	40.9	49.6	180,000	23, p. 65; 24, p. 126; 25, p. 12; 43, p. 28; 47, p. 50; 48, p. 38
NC-SD56B	MB5DX6	B5DX6	3/31/2009	1310	9	4-6	65.9	6.3	46.2	47.5	170,000	23, p. 65; 24, p. 128; 25, p. 13; 43, p. 28; 47, p. 50; 48, p. 38
NC-SD57B	MB5DX8	B5DX8	3/31/2009	1235	16	4-6	69.4	3.1	55.7	41.2	180,000	23, p. 65; 24, p. 127; 25, p. 13; 43, p. 29; 47, p. 50; 48, p. 38
NC-SD58B	MB5DY0	B5DY0	3/31/2009	1345	14	4-6	64.5	13.4	50.9	35.8	250,000	23, p. 65; 24, p. 129; 25, p. 13; 43, p. 29; 47, p. 51; 48, p. 38
NC-SD59B	MB5DY2	B5DY2	3/31/2009	1445	20	4-5.5	52.8	8.7	57.5	33.7	95,000	23, p. 66; 24, p. 131; 25, p. 13; 43, p. 30; 47, p. 51; 48, p. 39
NC-SD60B	MB5DY4	B5DY4	3/31/2009	1410	14	4-5.5	68.9	18.4	54.6	27.1	310,000	23, p. 65; 24, p. 130; 25, p. 13; 43, p. 31; 47, p. 51; 48, p. 39
NC-SD63B	MB5DZ0	B5DZ0	4/1/2009	0935	7	4-6	66.6	15.4	40.3	44.3	230,000	23, p. 67; 24, p. 133; 25, p. 13; 43, p. 31; 47, p. 52; 48, p. 39
NC-SD94B	MB5E52	B5E52					66.5	18.3	50.5	31.2	210,000	23, p. 67; 24, p. 133; 25, p. 15; 43, p. 35; 47, p. 54; 48, p. 41
NC-SD65B	MB5DZ4	B5DZ4	4/1/2009	1005	9	4-6	68.5	12.0	41.0	47.0	180,000	23, p. 67; 24, p. 134; 25, p. 14; 43, p. 32; 47, p. 52; 48, p. 39
NC-SD67B	MB5DZ8	B5DZ8	3/31/2009	1605	17	4-6	54.1	42.1	32.3	25.6	310,000	23, p. 66; 24, p. 132; 25, p. 14; 43, p. 33; 47, p. 52; 48, p. 40
NC-SD68B	MB5E00	B5E00	4/1/2009	1100	16	3.5-4.5	66.8	39.7	40.0	20.3	240,000	23, p. 68; 24, p. 135; 25, p. 14; 43, p. 33; 47, p. 53; 48, p. 40
NC-SD69B	MB5E02	B5E02	4/1/2009	1355	16	4-5.5	68.2	23.9	47.9	28.2	230,000	23, p. 69; 24, p. 137; 25, p. 14; 43, p. 34; 47, p. 53; 48, p. 40
NC-SD71B	MB5E06	B5E06	4/1/2009	1225	19	3.5-4	65.7	36.5	39.7	23.8	210,000	23, p. 68; 24, p. 136; 25, p. 14; 43, p. 35; 47, p. 53; 48, p. 40
NC-SD74B	MB5E12	B5E12	3/16/2009	1400	12	4-4.5	63.8	15.4	50.7	33.9	130,000 J	23, p. 41; 24, p. 97; 25, p. 14; 42, p. 27; 47, p. 40; 48, p. 31
NC-SD75B	MB5E14	B5E14	3/16/2009	1050	15	3.5-4	61.3	12.6	54.6	32.8	110,000 J	23, p. 40; 24, p. 94; 25, p. 14; 42, p. 27; 47, p. 41; 48, p. 31
NC-SD76B	MB5E16	B5E16	3/16/2009	1140	9	4-6	61.3	26.2	48.7	25.1	99,000 J	23, p. 41; 24, p. 95; 25, p. 15; 42, p. 28; 47, p. 41; 48, p. 31
NC-SD92B	MB5E48	B5E48					61.3	22.1	50.8	27.1	89,000 J	23, p. 41; 24, p. 95; 25, p. 15; 42, p. 29; 47, p. 41; 48, p. 31

* The percent moisture as reported for the inorganics fraction.
ft = feet
mg/kg = milligrams per kilogram
J - The reported value is an estimate [Ref. 48, p. 1].

Table 3
Background and Observed Release Concentrations
Surface Samples (0'-2') - February 2009
Newtown Creek, Brooklyn/Queens, NY

	Background Concentrations												Guidance Criteria						Observed Release Concentrations			
SAT2 Sample No.	NC-SD107A		NC-SD108A		NC-SD109A		NC-SD110A		NC-SD111A		NC-SD112A		CRQL	Maximum Background	Adjust-ment Factor	Adjusted Back-ground	Adjusted Background x3 (non-J must exceed)	Adj. BG x3 x Adj. Factor (J must exceed)	**NC-SD01A**		**NC-SD03A**	
EPA Sample No.	(M)B5E77		(M)B5E79		(M)B5E81		(M)B5E83		(M)B5E85		(M)B5E87								(M)B5DJ5		(M)B5DJ9	
Date:	2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009								2/11/2009		2/11/2009	
Depth (ft)	0-2		0-2		0-2		0-2		0-2		0-2								0-2		0-2	
Comments																			MS/MSD			
Reference(s)	23, p. 26; 24, p. 76; 25, pp. 67, 72		23, p. 26; 24, p. 75; 25, pp. 67, 72		24, p. 78; 25, pp. 67, 72		23, p. 26; 24, p. 77; 25, pp. 67, 72		23, p. 27; 24, p. 80; 25, pp. 67, 72		23, p. 27; 24, p. 79; 25, pp. 67, 72								23, pp. 8-9; 24, p. 2; 25, pp. 25-26		23, p. 9; 24, p. 3; 25, pp. 25-26	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL										
Arsenic											*12.3 J*	3.204	1	12.3 J	1.74	21.402	64.206	111.71844				
Cadmium	*1.6 UJ*	1.6	1.5 UJ	1.5	1.5 UJ	1.5	*1.6 UJ*	1.6	*1.6 UJ*	1.6	*1.6 UJ*	1.602	0.5	1.6 UJ	1.41	1.6	1.6	2.256				
Calcium	*9,700 J*	1553	8,460 J	1511	8,880 J	1541	9,590 J	1577	8,100 J	1639	8,750 J	1602	500	9,700 J	1.28	12,416	37,248	47,677.44				
Chromium	71.9 J	3.1	68.4 J	3.0	67 J	3.1	*75 J*	3.2	67.6 J	3.3	67.8 J	3.204	1	75 J	1.29	96.75	290.25	374.4225				
Copper	*106 J*	7.8	98.1 J	7.6	98.9 J	7.7	105 J	7.9	97.2 J	8.197	98.4 J	8.0	2.5	106 J	1.22	129.32	387.96	473.3112				
Lead	*112 J*	3.1	103 J	3.0	104 J	3.1	110 J	3.2	102 J	3.3	104 J	3.204	1	112 J	1.44	161.28	483.84	696.7296				
Nickel	27.9 J	12.4	28.8 J	12.08	26 J	12.33	*29.8 J*	12.62	28.4 J	13.11	28.8 J	12.82	4	29.8 J	1.35	40.23	120.69	162.9315				
Silver	*2.6 J*	3.1	2.4 J	3.0	2.4 J	3.1	2.5 J	3.2	2.4 J	3.3	2.4 J	3.204	1	2.6 J	1.74	4.524	13.572	23.61528				
Zinc	217 J	18.6	216 J	18.13	205 J	18.5	*231 J*	18.93	210 J	19.67	217 J	19.23	6	231 J	1.50	346.5	1,039.5	1,559.25				
Reference(s)	29, pp. 46, 60-63, 92-93		29, pp. 47, 60-63, 93		29, pp. 48, 60-63, 93-94		29, pp. 49, 60-63, 94		29, pp. 50, 60-63, 94-95		29, pp. 23, 60-62, 79		1, p. 51589; 29, pp. 23, 46-50, 60-63, 79, 92-95; 50, pp. 4-9, 18; 51, p. 6									
VOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL										
Chlorobenzene	25 UJ	25	24 U	24	22 U	22	24 U	24	*25 U*	25	24 U	24	5	25 U	2.0	25	25	50				
Isopropylbenzene	25 UJ	25	24 U	24	22 U	22	24 U	24	*25 U*	25	24 U	24	5	25 U	10	25	25	250				
Reference(s)	35, pp. 17, 22, 95, 208-209		35, pp. 17, 96, 210-211		35, pp. 17, 97, 211-212		35, pp. 17, 98, 213-214		35, pp. 17, 99, 214-215		35, pp. 17, 100, 216-217		1, p. 51589; 35, pp. 17-22, 95-100, 208-217; 50, pp. 4-9, 12; 51, p. 2									
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL							Result	SQL	Result	SQL
Acenaphthene	590 UJ	590	520 U	520	550 U	550	*550 U*	*550*	560 U	560	540 U	540	170	550 U	4.68	550	550	2,574.0				
Fluorene	590 UJ	590	520 U	520	550 U	550	*550 U*	*550*	560 U	560	540 U	540	170	550 U	10	550	550	5,500				
Phenanthrene	32 J	590	25 J	520	24 J	550	19 J	*550*	20 J	560	23 J	540	170	550 U	10	550	550	5,500	**600**	440	**1,200**	420
Anthracene	590 UJ	590	520 U	520	550 U	550	*550 U*	*550*	560 U	560	540 U	540	170	550 U	10	550	550	5,500	**780**	440		
Fluoranthene	71 J	590	42 J	520	41 J	550	35 J	*550*	43 J	560	46 J	540	170	550 U	10	550	550	5,500	**1,100**	440	**1,300**	420
Pyrene	75 J	590	49 J	520	45 J	550	34 J	*550*	44 J	560	48 J	540	170	550 U	11.86	550	550	6,523.0				
Butylbenzylphthalate	590 UJ	590	520 U	520	550 U	550	*550 U*	*550*	560 U	560	540 U	540	170	550 U	10	550	550	5,500				
Benzo(a)anthracene	49 J	590	33 J	520	30 J	550	27 J	*550*	30 J	560	35 J	540	170	550 U	10	550	550	5,500	**730**	440	**630**	420
Chrysene	52 J	590	36 J	520	32 J	550	27 J	*550*	28 J	560	31 J	540	170	550 U	10	550	550	5,500	**680**	440	**650**	420
Bis(2-ethylhexyl)phthalate	590 UJ	590	520 U	520	550 U	550	*550 U*	*550*	560 U	560	540 U	540	170	550 U	10	550	550	5,500	**640**	440		
Benzo(b)fluoranthene	54 J	590	36 J	520	35 J	550	32 J	*550*	35 J	560	42 J	540	170	550 U	10	550	550	5,500	**710**	440	**760**	420
Benzo(a)pyrene	45 J	590	36 J	520	31 J	550	29 J	*550*	29 J	560	34 J	540	170	550 U	10	550	550	5,500	**690**	440	**630**	420
Indeno(1,2,3-cd)pyrene	40 J	590	29 J	520	28 J	550	27 J	*550*	27 J	560	27 J	540	170	550 U	10	550	550	5,500				
Benzo(g,h,i)perylene	38 J	590	31 J	520	27 J	550	24 J	*550*	24 J	560	28 J	540	170	550 U	10	550	550	5,500				
Reference(s)	35, pp. 23-28, 114-115, 232-233		35, pp. 23-25, 116-117, 234-235		35, pp. 23-25, 118-119, 236-237		35, pp. 23-25, 120-121, 238-239		35, pp. 23-25, 122-123, 240-241		35, pp. 23-25, 124-125, 242-243		1, p. 51589; 35, pp. 23-28, 114-125, 232-243; 50, pp. 4-9, 14-15; 51, p. 4						30, pp. 25-26, 61		30, pp. 33-34, 68-69	
PCBs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL										
Aroclor-1242	110 UJ	110	100 U	100	*110 U*	110	*110 U*	110	*110 U*	110	*110 U*	110	33	110 U	10	110	110	1,100				
Aroclor-1254	110 UJ	110	100 U	100	*110 U*	110	*110 U*	110	*110 U*	110	*110 U*	110	33	110 U	10	110	110	1,100				
Reference(s)	35, pp. 29-32, 140, 248		35, pp. 29, 141, 248		35, pp. 29, 142, 248		35, pp. 29, 143, 249		35, pp. 29, 144, 249		35, pp. 29, 145, 249		1, p. 51589; 35, pp. 29-32, 140-145, 248-249; 50, pp. 4-9, 16; 51, p. 5									

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 3
Background and Observed Release Concentrations
Surface Samples (0'-2') - February 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)																							
SAT2 Sample No.	**NC-SD21A**		**NC-SD22A**		**NC-SD23A**		**NC-SD24A**		**NC-SD25A**		**NC-SD26A**		**NC-SD27A**		**NC-SD28A**		**NC-SD29A**		**NC-SD30A**		**NC-SD31A**		**NC-SD32A**	
EPA Sample No.	(M)B5DN5		(M)B5DN7		(M)B5DN9		(M)B5DP1		(M)B5DP3		(M)B5DP5		(M)B5DP7		(M)B5DP9		(M)B5DQ1		(M)B5DQ3		(M)B5DQ5		(M)B5DQ7	
Date:	2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009	
Depth (ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Comments	MS/MSD																							
Reference(s)	23, p. 19; 24, p. 23; 25, pp. 40, 47		23, p. 18; 24, p. 22; 25, pp. 40, 49		23, p. 19; 24, p. 26; 25, pp. 40, 47		23, p. 19; 24, p. 27; 25, pp. 40, 47		23, p. 19; 24, p. 28; 25, pp. 41, 47		23, p. 19; 24, p. 29; 25, pp. 41, 47		23, p. 19; 24, p. 30; 25, pp. 41, 47		23, p. 19; 24, p. 31; 25, pp. 41, 48		23, p. 19; 24, p. 33; 25, pp. 41, 48		23, p. 19; 24, p. 32; 25, pp. 41, 48		23, p. 19; 24, p. 35; 25, pp. 41, 48		23, p. 19; 24, p. 34; 25, pp. 41, 48	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Arsenic																								
Cadmium	**3.5 J**	1.3	**6.1 J**	1.4	**3.5 J**	1.5	**4.4 J**	1.4	**36.8 J**	1.3	**2.0**	0.94	**4.2 J**	1.4	**5.0 J**	1.4	**4.1 J**	1.5	**6.2 J**	1.4	**4.8 J**	1.6	**5.8 J**	1.6
Calcium											**49,700**	942												
Chromium									**395 J**	2.6														
Copper									**1,280 J**	6.6														
Lead									**1,020 J**	2.6					**927 J**	2.7								
Nickel									**348 J**	10.5														
Silver																								
Zinc									**2,170 J**	15.8														
Reference(s)	28, pp. 10, 55-57, 63		28, pp. 11, 55-57, 65		28, pp. 12, 55-57, 66		28, pp. 13, 55-57, 67		28, pp. 14, 55-57, 67-68		28, pp. 15, 55-57, 68		28, pp. 16, 55-57, 69		28, pp. 17, 55-57, 69-70		28, pp. 18, 55-57, 70		28, pp. 19, 55-57, 71		28, pp. 20, 55-57, 71		28, pp. 21, 55-57, 72	
VOCs (ug/kg, dry weight)																								
Chlorobenzene																								
Isopropylbenzene																								
Reference(s)																								
SVOCs (ug/kg, dry weight)			Result	SQL					Result	SQL					Result	SQL								
Acenaphthene																								
Fluorene																								
Phenanthrene																								
Anthracene																								
Fluoranthene			**1,300**	480					**640**	460														
Pyrene			**1,400**	480					**720**	460														
Butylbenzylphthalate			**670**	480																				
Benzo(a)anthracene			**820**	480																				
Chrysene			**740**	480																				
Bis(2-ethylhexyl)phthalate			**4,200**	480					**3,400**	460					**1,100**	460								
Benzo(b)fluoranthene			**1,100**	480																				
Benzo(a)pyrene			**820**	480																				
Indeno(1,2,3-cd)pyrene			**670**	480																				
Benzo(g,h,i)perylene			**710**	480																				
Reference(s)			33, pp. 90-91, 265						33, pp. 96, 271						33, pp. 19, 193									
PCBs (ug/kg, dry weight)																								
Aroclor-1242																								
Aroclor-1254																								
Reference(s)																								

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 3
Background and Observed Release Concentrations
Surface Samples (0'-2') - February 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)																							
SAT2 Sample No.	**NC-SD33A**		**NC-SD34A**		**NC-SD35A**		**NC-SD36A**		**NC-SD37A**		**NC-SD38A**		**NC-SD39A**		**NC-SD40A**		**NC-SD41A**		**NC-SD42A**		**NC-SD43A**		**NC-SD44A**	
EPA Sample No.	(M)B5DQ9		(M)B5DR1		(M)B5DR3		(M)B5DR5		(M)B5DR7		(M)B5DR9		(M)B5DS1		(M)B5DS3		(M)B5DS5		(M)B5DS7		(M)B5DS9		(M)B5DT1	
Date:	2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/25/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009	
Depth (ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Comments																	MS/MSD							
Reference(s)	23, p. 19; 24, p. 37; 25, pp. 41, 48		23, p. 19; 24, p. 36; 25, pp. 41, 48		23, p. 19; 24, p. 39; 25, pp. 41, 50		23, p. 19; 24, p. 38; 25, pp. 43, 48		23, p. 19; 24, p. 40; 25, pp. 43, 50		23, p. 20; 24, p. 41; 25, pp. 43, 50		23, p. 21; 24, p. 42; 25, pp. 55, 64		23, p. 21; 24, p. 43; 25, pp. 55, 64		23, p. 21; 24, p. 44; 25, pp. 55, 64		23, p. 21; 24, p. 45; 25, pp. 55, 64		23, p. 21; 24, p. 46; 25, pp. 55, 64		23, p. 21; 24, p. 47; 25, pp. 55, 64	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Arsenic																								
Cadmium	**5.4 J**	1.6	**5.2 J**	1.6			**17.0 J**	1.6	**8.2 J**	1.8	**9.0 J**	1.7	**8.3 J**	1.6	**32.3 J**	1.7	**7.5 J**	1.6	**5.4 J**	1.9	**6.5 J**	1.6	**7.0 J**	1.7
Calcium																								
Chromium															**375 J**	3.4								
Copper					**520**	3.5	**1,010 J**	8.0	**667 J**	9.1	**709 J**	8.4	**753 J**	8.1	**2,160 J**	8.4	**769 J**	7.8	**643 J**	9.4	**802 J**	7.9	**1,060 J**	8.5
Lead							**787 J**	3.2							**718 J**	3.4								
Nickel					**140**	5.6	**173 J**	12.9							**290 J**	13.5								
Silver																								
Zinc															**2,140 J**	20.2								
Reference(s)	28, pp. 22, 55-57, 73		28, pp. 36, 55-57, 74		28, pp. 37, 55-57, 74-75		28, pp. 38, 55-57, 75		28, pp. 39, 55-57, 76		28, pp. 40, 55-57, 76		29, pp. 3, 60-62, 64		29, pp. 4, 60-62, 3-4 64-65		29, pp. 5, 60-62, 65		29, pp. 6, 60-62, 68		29, pp. 7, 60-62, 68		29, pp. 8, 60-62, 69	
VOCs (ug/kg, dry weight)																								
Chlorobenzene																								
Isopropylbenzene																								
Reference(s)																								
SVOCs (ug/kg, dry weight)					Result	SQL	Result	SQL			Result	SQL												
Acenaphthene																								
Fluorene																								
Phenanthrene					**980**	300																		
Anthracene					**820**	300																		
Fluoranthene					**3,200**	300																		
Pyrene					**2,900**	300																		
Butylbenzylphthalate																								
Benzo(a)anthracene					**1,800**	300																		
Chrysene					**1,600**	300																		
Bis(2-ethylhexyl)phthalate							**950**	550			**600**	560												
Benzo(b)fluoranthene					**1,100**	300																		
Benzo(a)pyrene					**1,000**	300																		
Indeno(1,2,3-cd)pyrene																								
Benzo(g,h,i)perylene																								
Reference(s)					33, pp. 102-103, 276-277		33, pp. 33, 206				33, pp. 106, 280													
PCBs (ug/kg, dry weight)																								
Aroclor-1242																								
Aroclor-1254																								
Reference(s)																								

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 3
Background and Observed Release Concentrations
Surface Samples (0'-2') - February 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)																							
SAT2 Sample No.	**NC-SD45A**		**NC-SD46A**		**NC-SD47A**		**NC-SD48A**		**NC-SD49A**		**NC-SD50A**		**NC-SD51A**		**NC-SD52A**		**NC-SD53A**		**NC-SD54A**		**NC-SD55A**		**NC-SD56A**	
EPA Sample No.	(M)B5DT3		(M)B5DT5		(M)B5DT7		(M)B5DT9		(M)B5DW1		(M)B5DW3		(M)B5DW5		(M)B5DW7		(M)B5DW9		(M)B5DX1		(M)B5DX3		(M)B5DX5	
Date:	2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009		2/26/2009	
Depth (ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Comments																								
Reference(s)	23, p. 21; 24, p. 48; 25, pp. 56, 64		23, p. 21; 24, p. 49; 25, pp. 56, 64		23, p. 21; 24, p. 50; 25, pp. 56, 64		23, p. 21; 24, p. 51; 25, pp. 56, 64		23, p. 22; 24, p. 53; 25, pp. 57, 64		23, p. 22; 24, p. 52; 25, pp. 56, 65		23, p. 22; 24, p. 55; 25, pp. 57, 65		23, p. 22; 24, p. 54; 25, pp. 58, 65		23, p. 22; 24, p. 57; 25, pp. 58, 65		23, p. 22; 24, p. 56; 25, pp. 59, 65		23, p. 23; 24, p. 59; 25, pp. 59, 65		23, p. 22; 24, p. 58; 25, pp. 60, 65	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Arsenic													**197 J**	3.9			**189 J**	3.6						
Cadmium	**9.0 J**	1.5	**11.8 J**	1.6	**13.5 J**	1.4	**13.2 J**	1.5	**14.9 J**	1.6	**8.2 J**	1.2	**94.6 J**	1.9	**24.5 J**	2.0	**124 J**	1.8	**26.5 J**	2.0	**62.2 J**	2.2	**44.1 J**	2.1
Calcium																								
Chromium													**848 J**	3.9			**1,000 J**	3.6			**616 J**	4.3	**448 J**	4.3
Copper	**1,070 J**	7.7	**1,670 J**	8.1	**1,730 J**	7.2	**1,850 J**	7.6	**1,840 J**	7.9	**1,360 J**	5.8	**11,000 J**	9.7	**2,700 J**	10.0	**12,100 J**	8.9	**2,660 J**	9.8	**5,310 J**	10.8	**4,170 J**	10.6
Lead													**1,270 J**	3.9			**1,480 J**	3.6			**981 J**	4.3	**800 J**	4.3
Nickel					**184 J**	11.6	**197 J**	12.2	**181 J**	12.6			**1,420 J**	15.5	**287 J**	15.9	**1,420 J**	14.2	**328 J**	15.7	**695 J**	17.2	**514 J**	17
Silver													**43.4 J**	3.9			**46.1 J**	3.6			**27.1 J**	4.3		
Zinc													**6,530 J**	23.3	**2,020 J**	23.9	**7,340 J**	21.4	**2,530 J**	23.5	**4,440 J**	25.9	**3,370 J**	25.5
Reference(s)	29, pp. 9, 60-62, 70		29, pp. 10, 60-62, 70		29, pp. 11, 60-62, 71		29, pp. 12, 60-62, 72		29, pp. 13, 60-62, 72		29, pp. 14, 60-62, 73		29, pp. 15, 60-62, 73-74		29, pp. 16, 60-62, 74-75		29, pp. 17, 60-62, 75		29, pp. 18, 60-62, 75-76		29, pp. 19, 60-62, 76-77		29, pp. 20, 60-62, 77	
VOCs (ug/kg, dry weight)													Result	SQL			Result	SQL						
Chlorobenzene													**69 J**	31										
Isopropylbenzene																								
Reference(s)													34, pp. 40-41, 150, 204-205											
SVOCs (ug/kg, dry weight)	Result	SQL							Result	SQL			Result	SQL			Result	SQL			Result	SQL		
Acenaphthene																								
Fluorene																								
Phenanthrene	**660**	550																						
Anthracene																								
Fluoranthene	**1,000**	550							**760**	500														
Pyrene	**1,000**	550							**680**	500														
Butylbenzylphthalate																								
Benzo(a)anthracene																								
Chrysene																								
Bis(2-ethylhexyl)phthalate													**19,000 J**	640			**12,000 J**	590			**8,900 J**	740		
Benzo(b)fluoranthene																								
Benzo(a)pyrene																								
Indeno(1,2,3-cd)pyrene																								
Benzo(g,h,i)perylene																								
Reference(s)	34, pp. 83, 247								34, pp. 95, 254				34, pp. 101, 156, 258				34, pp. 107, 156, 264				34, pp. 113, 156, 269			
PCBs (ug/kg, dry weight)																								
Aroclor-1242																								
Aroclor-1254																								
Reference(s)																								

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 3
Background and Observed Release Concentrations
Surface Samples (0'-2') - February 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)																							
SAT2 Sample No.	**NC-SD57A**		**NC-SD93A**		**NC-SD58A**		**NC-SD59A**		**NC-SD60A**		**NC-SD61A**		**NC-SD62A**		**NC-SD63A**		**NC-SD64A**		**NC-SD65A**		**NC-SD66A**		**NC-SD67A**	
EPA Sample No.	(M)B5DX7		(M)B5E49		(M)B5DX9		(M)B5DY1		(M)B5DY3		(M)B5DY5		(M)B5DY7		(M)B5DY9		(M)B5DZ1		(M)B5DZ3		(M)B5DZ5		(M)B5DZ7	
Date:	2/27/2009		2/27/2009		2/26/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009	
Depth (ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Comments			Dup. (SD57A)								MS/MSD													
Reference(s)	23, p. 25; 24, p. 61; 25, pp. 65, 73		23, p. 25; 24, p. 61; 25, pp. 65, 67		23, p. 23; 24, p. 60; 25, pp. 60, 65		23, p. 25; 24, p. 63; 25, pp. 65, 74		23, p. 25; 24, p. 62; 25, pp. 65, 74		23, p. 25; 24, p. 65; 25, pp. 66, 75		23, p. 25; 24, p. 64; 25, pp. 66, 75		23, p. 25; 24, p. 67; 25, pp. 66, 71		23, p. 25; 24, p. 66; 25, pp. 66, 71		23, p. 26; 24, p. 69; 25, pp. 66, 71		23, p. 25; 24, p. 68; 25, pp. 66, 71		23, p. 26; 24, p. 70; 25, pp. 66, 76	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Arsenic																								
Cadmium	**36.1 J**	2.7	**38.5 J**	2.8	**29.5 J**	2.5	**36.5 J**	2.5	**40.0 J**	2.3	**17.0 J**	2.5	**4.3**	0.7	**11.4 J**	2.2	**21.8 J**	1.0	**43.4 J**	2.4	**6.2 J**	1.9	**42.9 J**	1.5
Calcium																								
Chromium			**393 J**	5.6			**381 J**	5.0	**411 J**	4.6									**509 J**	4.8			**461 J**	3.1
Copper	**2,530 J**	13.7	**2,680 J**	14.1	**2,480 J**	12.3	**2,470 J**	12.6	**2,490 J**	11.5	**2,350 J**	12.5	**810 J**	3.7	**799 J**	11.1	**890 J**	5.0	**2,100 J**	12.0	**514 J**	9.4	**1,950 J**	7.7
Lead									**737 J**	4.6	**838 J**	5.0							**870 J**	4.8				
Nickel	**361 J**	22.0	**378 J**	22.6	**328 J**	19.6	**341 J**	20.1	**360 J**	18.4	**281 J**	20.0	**138**	6.0			**182 J**	8.0	**398 J**	19.2			**361 J**	12.3
Silver																								
Zinc	**2,850 J**	33.0	**2,990 J**	33.9	**2,430 J**	29.4	**2,910 J**	30.2	**3,190 J**	27.6	**2,220 J**	30.0	**3,560**	9.0	**1,650 J**	26.7	**1,880 J**	12.0	**4,110 J**	28.8	**1,700 J**	22.6	**3,450 J**	18.4
Reference(s)	29, pp. 21, 60-62, 77-78		29, pp. 44, 60-63, 91		29, pp. 22, 60-62, 78-79		29, pp. 31, 60-63, 81		29, pp. 32, 60-63, 81-82		29, pp. 33, 60-63, 82-83		29, pp. 34, 60-63, 85		29, pp. 35, 60-63, 85-86		29, pp. 36, 60-63, 86		29, pp. 37, 60-63, 86-87		29, pp. 38, 60-63, 87-88		29, pp. 39, 60-63, 88	
VOCs (ug/kg, dry weight)													Result	SQL										
Chlorobenzene																								
Isopropylbenzene													**78**	12										
Reference(s)													35, pp. 38, 154											
SVOCs (ug/kg, dry weight)													Result	SQL			Result	SQL						
Acenaphthene																								
Fluorene																								
Phenanthrene																								
Anthracene																								
Fluoranthene													**7,900**	2,400									**880**	860
Pyrene													**12,000**	2,400			**2,100**	2,100					**1,200**	860
Butylbenzylphthalate																								
Benzo(a)anthracene													**3,900**	2,400										
Chrysene													**3,600**	2,400										
Bis(2-ethylhexyl)phthalate													**16,000**	2,400			**11,000**	2,100					**6,000**	860
Benzo(b)fluoranthene													**2,700**	2,400										
Benzo(a)pyrene													**2,800**	2,400										
Indeno(1,2,3-cd)pyrene																								
Benzo(g,h,i)perylene																								
Reference(s)													35, pp. 56-57, 176-177				35, pp. 108, 228						35, pp. 58, 178	
PCBs (ug/kg, dry weight)													Result	SQL										
Aroclor-1242													**3,800 J**	57										
Aroclor-1254													**3,600 J**	57										
Reference(s)													35, pp. 15, 81, 194											

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 3
Background and Observed Release Concentrations
Surface Samples (0'-2') - February 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)															
SAT2 Sample No.	**NC-SD68A**		**NC-SD69A**		**NC-SD94A**		**NC-SD70A**		**NC-SD71A**		**NC-SD74A**		**NC-SD75A**		**NC-SD76A**	
EPA Sample No.	(M)B5DZ9		(M)B5E01		(M)B5E51		(M)B5E03		(M)B5E05		(M)B5E11		(M)B5E13		(M)B5E15	
Date:	2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/27/2009		2/25/2009		2/25/2009		2/25/2009	
Depth (ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Comments					Dup. (SD69A)											
Reference(s)	23, p. 26; 24, p. 71; 25, pp. 66, 76		23, p. 26; 24, p. 72; 25, pp. 66, 77		23, p. 26; 24, p. 72; 25, pp. 67, 77		23, p. 26; 24, p. 73; 25, pp. 66, 78		23, p. 26; 24, p. 74; 25, pp. 66, 78		23, p. 18; 24, p. 21; 25, pp. 43, 49		23, p. 19; 24, p. 24; 25, pp. 43, 47		23, p. 19; 24, p. 25; 25, pp. 43, 47	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Arsenic																
Cadmium	**60.0 J**	1.5	**41.7 J**	1.9	**56.0 J**	1.9	**140 J**	1.6	**457 J**	1.6	**5.8 J**	1.5	**3.3 J**	1.5	**13.3 J**	2.2
Calcium																
Chromium	**526 J**	3.0	**406 J**	3.9	**500 J**	3.8	**982 J**	3.2	**2,140 J**	3.3						
Copper	**1,910 J**	7.6	**1,760 J**	9.7	**1,950 J**	9.5	**3,230 J**	8.0	**5,910 J**	8.2					**595 J**	11.1
Lead	**759 J**	3.0	**910 J**	3.9	**973 J**	3.8	**1,440 J**	3.2	**2,080 J**	3.3						
Nickel	**428 J**	12.1	**357 J**	15.6	**429 J**	15.3	**709 J**	12.8	**1,790 J**	13.1						
Silver							**28.7 J**	3.2	**60.9 J**	3.3						
Zinc	**3,940 J**	18.2	**2,930 J**	23.3	**3,490 J**	22.9	**5,900 J**	19.2	**9,210 J**	19.6						
Reference(s)	29, pp. 40, 60-63, 88-89		29, pp. 41, 60-63, 89		29, pp. 45, 60-63, 91-92		29, pp. 42, 60-63, 90		29, pp. 43, 60-63, 90-91		28, pp. 41, 55-57, 77		28, pp. 42, 55-57, 77		28, pp. 43, 55-57, 78	
VOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL										
Chlorobenzene																
Isopropylbenzene																
Reference(s)																
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL			Result	SQL	Result	SQL						
Acenaphthene	**1,700**	1,400	**4,600 J**	1,900												
Fluorene			**2,600 J**	1,900												
Phenanthrene	**4,900**	1,400	**12,000 J**	1,900					**800**	550						
Anthracene	**1,900**	1,400														
Fluoranthene	**3,300**	1,400	**6,800 J**	1,900					**1,000**	550						
Pyrene	**5,000**	1,400	**7,600 J**	1,900					**1,400**	550						
Butylbenzylphthalate																
Benzo(a)anthracene	**2,000**	1,400														
Chrysene	**1,800**	1,400														
Bis(2-ethylhexyl)phthalate	**9,000**	1,400					**54,000**	7,900	**8,200**	550						
Benzo(b)fluoranthene	**1,500**	1,400														
Benzo(a)pyrene	**1,500**	1,400														
Indeno(1,2,3-cd)pyrene																
Benzo(g,h,i)perylene																
Reference(s)	35, pp. 60-61, 180		35, pp. 8, 11, 62, 181-182				35, pp. 64, 184		35, pp.66, 186							
PCBs (ug/kg, dry weight)					Result	SQL	Result	SQL	Result	SQL						
Aroclor-1242					**1,500 J**	130	**1,200 J**	96	**2,300**	110						
Aroclor-1254									**3,000 J**	110						
Reference(s)					35, pp. 15-16, 90, 197		35, pp. 15, 86, 196		35, pp. 15, 87, 196							

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 4
Background and Observed Release Concentrations
Subsurface Samples - February-April 2009
Newtown Creek, Brooklyn/Queens, NY

	Background Concentrations												Guidance Criteria						Observed Release Concentrations									
SAT2 Sample No.	NC-SD107B		NC-SD108B		NC-SD109B		NC-SD110B		NC-SD111B		NC-SD112B		CRQL	Maximum Background	Adjustment Factor	Adjusted Background	Adjusted Background x3 (non-J must exceed)	Adj. BG x3 x Adj. Factor (J must exceed)	**NC-SD01B**		**NC-SD07B**		**NC-SD08B**		**NC-SD09B**		**NC-SD10B**	
EPA Sample No.	(M)B5E78		(M)B5E80		(M)B5E82		(M)B5E84		(M)B5E86		(M)B5E88								B5DJ6		B5DK8		B5DL0		(M)B5DL2		(M)B5DL4	
Date:	3/10/2009		3/10/2009		3/10/2009		3/10/2009		3/10/2009		3/10/2009								2/11/2009		2/17/2009		2/17/2009		2/17/2009		2/17/2009	
Depth (feet)	4.0-6.0		4.0-5.0		4.0-6.0		4.0-6.0		4.0-6.0		4.0-5.5								3.5-4.0		4.0-6.0		4.0-6.0		4.0-5.75		4.0-4.8	
Comments																												
Reference(s)	23, p. 33; 24, p. 81; 25, pp. 82-83		23, p. 33; 24, p. 82; 25, pp. 82-83		23, p. 33; 24, p. 83; 25, pp. 82-83		23, p. 33; 24, p. 84; 25, pp. 82-83		23, p. 33; 24, p. 85; 25, pp. 82-83		23, p. 33; 24, p. 86; 25, pp. 82-83								23, p. 9; 24, p. 2; 25, pp. 25-26		23, p. 12; 24, p. 7; 25, pp. 30, 33		23, p. 12; 24, p. 8; 25, pp. 30, 33		23, p. 12; 24, p. 9; 25, pp. 30, 35		23, p. 13; 24, p. 10; 25, pp. 30, 35	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL													Result	SQL	Result	SQL
Antimony	16.5 UJ	16.5	16.7 UJ	16.7	16.2 UJ	16.2	17.2 UJ	17.2	16 UJ	16.0	18.2 UJ	18.2	6	18.2 UJ	1.98	18.2	18.2	36.036										
Arsenic	14.4 J	2.8	14.1 J	2.8	14.2 J	2.7	13.1 J	2.9	15.3 J	2.7	13.6 J	3.0	1	15.3 J	1.74	26.622	79.866	138.96684										
Cadmium	1.4 UJ	1.4	1.4 UJ	1.4	1.4 UJ	1.4	1.4 UJ	1.4	2.1 J	1.3	1.5 UJ	1.5	0.5	2.1 J	1.41	2.961	8.883	12.52503							**20.3 J**	1.2	**27.4 J**	1.3
Chromium	94.6 J	2.8	74.9 J	2.8	92.1 J	2.7	85 J	2.9	134 J	2.7	95.4 J	3.0	1	134 J	1.29	172.86	518.58	668.9682										
Cobalt	12.8 J	13.8	13.3 J	13.9	12.7 J	13.5	11.9 J	14.3	12 J	13.3	11.9 J	15.2	5	13.3 J	1.25	16.625	49.875	62.34375										
Copper	137 J	6.9	95.7 J	6.9	126 J	6.8	123 J	7.2	176 J	6.7	143 J	7.6	2.5	176 J	1.22	214.72	644.16	785.8752							**882 J**	6.0	**1,280 J**	6.3
Lead	155 J	2.8	114 J	2.8	135 J	2.7	136 J	2.9	163 J	2.7	151 J	3.0	1	163 J	1.44	234.72	704.16	1,013.9904										
Nickel	37.2 J	11.0	34.9 J	11.1	41.4 J	10.8	34 J	11.5	38.6 J	10.7	41.5 J	12.1	4	41.5 J	1.35	56.025	168.075	226.90125										
Selenium	9.6 UJ	9.6	9.7 UJ	9.7	9.5 UJ	9.5	10 UJ	10.0	9.3 UJ	9.3	10.6 UJ	10.6	3.5	10.6 UJ	2.38	10.6	10.6	25.228										
Zinc	249 J	16.5	215 J	16.7	240 J	16.2	235 J	17.2	271 J	16.0	246 J	18.2	6	271 J	1.50	406.5	1,219.5	1,829.25										
Reference(s)	36, pp. 2-5, 14-15		36, pp. 2-4, 8, 16-17		36, pp. 2-4, 9, 17		36, pp. 2-4, 10, 17-18		36, pp. 2-4, 11, 18-19		36, pp. 2-4, 12, 19		1, p. 51589; 36, pp. 2-19; 50, pp. 4-9, 18; 51, p. 6												27, pp. 30, 52, 60		27, pp. 32, 52, 61	
VOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL																
Acetone	50	33	150	45	75	36	85	45	130	43	110	42	10	150	10	150	450	4,500										
Chloroform	16 U	16	23 U	23	18 U	18	22 U	22	21 U	21	21 U	21	5	23 U	10	23	23	230										
Chlorobenzene	16 U	16	23 U	23	18 U	18	22 U	22	21 U	21	21 U	21	5	23 U	2.0	23	23	46										
Isopropylbenzene	16 U	16	23 U	23	18 U	18	22 U	22	21 U	21	21 U	21	5	23 U	10	23	23	230										
Reference(s)	46, pp. 108, 281-282		46, pp. 109, 283-284		46, pp. 110, 284-285		46, pp. 111, 285-286		46, pp. 112, 287-288		46, pp. 113, 288-289		1, p. 51589; 46, pp. 108-113, 281-289; 50, pp. 4-9, 12; 51, pp. 1-2															
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL							Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Acetophenone	41 J	440	41 J	510	42 J	450	38 J	450	55 J	450	90 J	490	170	510 U	10	510	510	5,100										
Naphthalene	43 J	440	37 J	510	35 J	450	29 J	450	25 J	450	49 J	490	170	510 U	10	510	510	5,100										
2-Methylnaphthalene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	23 J	490	170	510 U	10	510	510	5,100							**910**	390		
1,1'-Biphenyl	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	490 U	490	170	510 U	10	510	510	5,100										
Acenaphthylene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	33 J	490	170	510 U	10	510	510	5,100										
Acenaphthene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	17 J	490	170	510 U	4.68	510	510	2,386.8										
Dibenzofuran	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	490 U	490	170	510 U	10	510	510	5,100										
Fluorene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	15 J	490	170	510 U	10	510	510	5,100							**580**	390		
Phenanthrene	16 J	440	510 U	510	14 J	450	450 U	450	450 U	450	80 J	490	170	510 U	10	510	510	5,100							**1,800**	390		
Anthracene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	45 J	490	170	510 U	10	510	510	5,100										
Carbazole	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	490 U	490	170	510 U	10	510	510	5,100										
Fluoranthene	38 J	440	16 J	510	31 J	450	450 U	450	14 J	450	490 U	490	170	510 U	10	510	510	5,100	**640**	480					**1,100**	390		
Pyrene	440 U	440	21 J	510	38 J	450	450 U	450	14 J	450	210 J	490	170	510 U	11.86	510	510	6,048.6							**1,200**	390		
Benzo(a)anthracene	30 J	440	17 J	510	28 J	450	450 U	450	14 J	450	130 J	490	170	510 U	10	510	510	5,100	**600**	480					**520**	390		
Chrysene	30 J	440	510 U	510	27 J	450	450 U	450	450 U	450	140 J	490	170	510 U	10	510	510	5,100	**600**	480								
Bis(2-ethylhexyl)phthalate	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	1,200 U	490	170	1,200 U	10	1200	1,200	12,000			**1,400**	480	**5,100**	440	**3,700**	390	**1,900**	420
Benzo(b)fluoranthene	32 J	440	510 U	510	32 J	450	450 U	450	450 U	450	170 J	490	170	510 U	10	510	510	5,100	**530**	480								
Benzo(k)fluoranthene	16 J	440	510 U	510	450 U	450	450 U	450	450 U	450	51 J	490	170	510 U	10	510	510	5,100										
Benzo(a)pyrene	32 J	440	510 U	510	23 J	450	450 U	450	450 U	450	150 J	490	170	510 U	10	510	510	5,100	**610**	480								
Indeno(1,2,3-cd)pyrene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	81 J	490	170	510 U	10	510	510	5,100										
Dibenzo(a,h)anthracene	440 U	440	510 U	510	450 U	450	450 U	450	450 U	450	26 J	490	170	510 U	10	510	510	5,100										
Benzo(g,h,i)perylene	22 J	440	510 U	510	17 J	450	450 U	450	450 U	450	98 J	490	170	510 U	10	510	510	5,100										
Reference(s)	46, pp. 119-120, 296-298		46, pp. 121-122, 298-300		46, pp. 123-124, 300-302		46, pp. 125-126, 302-303		46, pp. 127-128, 304-305		46, pp. 129-130, 305-307		1, p. 51589; 46, pp. 119-130, 296-307; 50, pp. 4-9, 13-15; 51, pp. 3-4						30, pp. 27-28, 63		31, pp. 89, 207		31, pp. 95, 211		31, pp.100-101, 214-215		31, pp.107, 219	
PCBs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL									Result	SQL					Result	SQL
Aroclor-1242	85 U	85	98 U	98	88 U	88	88 U	88	87 U	87	94 U	94	33	98 U	10	98	98	980			**120**	92						
Aroclor-1254	85 U	85	98 U	98	88 U	88	88 U	88	87 U	87	94 U	94	33	98 U	10	98	98	980									**220**	82
Reference(s)	46, pp. 139, 310		46, pp. 140, 311		46, pp. 141, 311		46, pp. 142, 311		46, pp. 143, 311		46, pp.144, 312		1, p. 51589; 46, pp. 139-144, 310-312; 50, pp. 4-9, 16; 51, p. 5								31, pp. 125, 228						31, pp. 131, 230	

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 4
Background and Observed Release Concentrations
Subsurface Samples - February-April 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)																											
SAT2 Sample No.	**NC-SD13B**		**NC-SD14B**		**NC-SD15B**		**NC-SD17B**		**NC-SD18B**		**NC-SD19B**		**NC-SD20B**		**NC-SD21B**		**NC-SD22B**		**NC-SD23B**		**NC-SD24B**		**NC-SD25B**		**NC-SD26B**		**NC-SD27B**	
EPA Sample No.	B5DM0		(M)B5DM2		(M)B5DM4		(M)B5DM8		(M)B5DN0		(M)B5DN2		(M)B5DN4		(M)B5DN6		(M)B5DN8		(M)B5DP0		(M)B5DP2		(M)B5DP4		(M)B5DP6		(M)B5DP8	
Date:	2/18/2009		3/13/2009		3/19/2009		3/13/2009		3/13/2009		3/13/2009		3/16/2009		3/16/2009		3/16/2009		3/17/2009		3/17/2009		3/17/2009		3/17/2009		3/18/2009	
Depth (feet)	4.0-5.8		4.0-4.5		4.0-5.5		4.0-5.0		4.0-6.0		4.0-6.0		4.0-5.0		4.0-5.0		4.0-5.0		3.0-3.5		2.0-3.0		4.0-6.0		3.5-4.0		2.75-3.25	
Comments																												
Reference(s)	23, p. 15; 24, p. 13; 25, pp. 34, 35		23, p. 37; 24, p. 88; 25, pp. 86-87		23, p. 50; 24, p. 105; 25, pp. 99, 102		23, p. 38; 24, p. 91; 25, pp. 86-87		23, p. 38; 24, p. 90; 25, pp. 86-87		23, p. 38; 24, p. 92; 25, pp. 86-87		23, p. 40; 24, p. 93; 25, pp. 90, 93		23, p. 41; 24, p. 96; 25, pp. 90, 93		23, p. 41; 24, p. 98; 25, pp. 90, 93		23, p. 44; 24, p. 100; 25, pp. 92-93		23, p. 44; 24, p. 99; 25, pp. 92-93		23, p. 46; 24, p. 102; 25, pp. 92-93		23, p. 45; 24, p. 101; 25, pp. 92-93		23, p. 48; 24, p. 104; 25, pp. 97, 102	
Metals (mg/kg, dry weight)			Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Antimony																												
Arsenic																												
Cadmium			**28.9 J**	1.4	**28.6 J**	1.1	**17.5 J**	1.4	**27.1 J**	1.4	**19.7 J**	1.0	**16.8 J**	1.4			**27.1 J**	1.2	**60.7 J**	1.3					**14.4 J**	1.1		
Chromium																												
Cobalt																												
Copper			**959 J**	6.9	**1,180 J**	5.7			**1,060 J**	7.1	**915 J**	5.2			**1,420 J**	6.2	**1,320 J**	6.2	**1,640 J**	6.5	**1,100**	4.8	**1,400 J**	5.1	**1,180 J**	5.3		
Lead																			**1,360 J**	2.6	**757**	1.9						
Nickel					**510 J**	9.1					**296 J**	8.2			**540 J**	10.0	**310 J**	9.9	**545 J**	10.5	**378**	7.7	**396 J**	8.1	**348 J**	8.5	**178**	6.5
Selenium															**44.2 J**	8.7												
Zinc					**1,900 J**	13.7													**3,610 J**	15.7	**1,270**	11.6						
Reference(s)			37, pp. 3, 9, 16		38, pp. 3, 5, 18		37, pp. 3, 11, 17		37, pp. 3, 12, 18		37, pp. 3, 13, 19		42, pp. 2, 19-20		42, pp. 6, 18-19, 23		42, pp. 7, 18-19, 23-24		42, pp. 8, 18-19, 24-25		42, pp. 9, 25		42, pp. 10, 18-19, 25-26		42, pp. 11, 18-19, 26		38, pp. 6, 19	
VOCs (ug/kg, dry weight)																												
Acetone																												
Chloroform																												
Chlorobenzene																												
Isopropylbenzene																												
Reference(s)																												
SVOCs (ug/kg, dry weight)	Result	SQL			Result	SQL	Result	SQL			Result	SQL			Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Acetophenone															**530**	430												
Naphthalene	**3,000**	1,500			**1,600**	390					**13,000**	10,000			**8,000**	430	**560**	410			**2,800**	430	**1,100**	330	**2,500**	450	**700**	280
2-Methylnaphthalene	**2,300**	1,500													**6,000**	430	**520**	410			**2,500**	430	**1,200**	330	**2,200**	450	**590**	280
1,1'-Biphenyl															**1,200**	430												
Acenaphthylene															**610**	430												
Acenaphthene	**15,000**	1,500			**1,500**	390					**17,000**	10,000			**6,100**	430	**560**	410			**1,800**	430	**1,100**	330	**1,300**	450	**550**	280
Dibenzofuran	**10,000**	1,500			**890**	390					**11,000**	10,000			**4,700**	430					**1,100**	430	**650**	330	**920**	450		
Fluorene	**24,000**	1,500			**1,800**	390					**21,000**	10,000			**9,600**	430	**690**	410			**3,100**	430	**1,500**	330	**2,400**	450	**810**	280
Phenanthrene	**84,000**	1,500			**4,700**	390					**78,000**	10,000			**47,000**	430	**2,900**	410	**540**	440	**10,000**	430	**5,900**	330	**8,400**	450	**3,700**	280
Anthracene	**87,000**	1,500			**2,400**	390					**32,000**	10,000			**6,100**	430	**930**	410			**3,500**	430	**1,400**	330	**2,500**	450	**1,200**	280
Carbazole	**10,000**	1,500			**560**	390									**680**	430												
Fluoranthene	**56,000**	1,500					**590**	450			**53,000**	10,000			**31,000**	430					**8,200**	430	**3,700**	330	**5,600**	450	**2,500**	280
Pyrene	**41,000**	1,500					**560**	450			**37,000**	10,000			**21,000**	430					**5,500**	430	**3,200**	330	**4,600**	450	**1,800**	280
Benzo(a)anthracene	**18,000**	1,500									**17,000**	10,000			**9,200**	430					**2,800**	430	**1,500**	330	**2,500**	450	**1,100**	280
Chrysene	**24,000**	1,500									**14,000**	10,000			**8,600**	430					**2,700**	430	**1,500**	330	**2,300**	450	**1,100**	280
Bis(2-ethylhexyl)phthalate	**4,000**	1,500			**4,300**	390																						
Benzo(b)fluoranthene	**12,000**	1,500			**720**	390					**11,000**	10,000			**4,800**	430					**1,800**	430	**950**	330	**1,400**	450	**580**	280
Benzo(k)fluoranthene	**4,500**	1,500													**1,800**	430					**670**	430						
Benzo(a)pyrene	**9,500**	1,500			**630**	390									**4,300**	430					**1,500**	430	**840**	330	**1,000**	450	**570**	280
Indeno(1,2,3-cd)pyrene	**4,900**	1,500													**1,700**	430					**710**	430			**520**	450		
Dibenzo(a,h)anthracene															**640**	430												
Benzo(g,h,i)perylene	**3,600**	1,500													**1,300**	430					**640**	430						
Reference(s)	32, pp. 32-33, 101-102				39, pp.37-38, 91-92		46, pp. 34, 213				46, pp. 38-39, 216-217				46, pp. 42-43, 219-221		46, pp. 46, 223-224		46, pp. 48, 226		46, pp. 50-51, 227-229		46, pp. 54-55, 230-231		46, pp. 58-59, 234-235		39, pp. 39-40, 93-94	
PCBs (ug/kg, dry weight)																												
Aroclor-1242																												
Aroclor-1254																												
Reference(s)																												

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 4
Background and Observed Release Concentrations
Subsurface Samples - February-April 2009
Newtown Creek, Brooklyn/Queens, NY

	Observed Release Concentrations (continued)																									
SAT2 Sample No.	**NC-SD28B**		**NC-SD29B**		**NC-SD30B**		**NC-SD31B**		**NC-SD32B**		**NC-SD33B**		**NC-SD34B**		**NC-SD36B**		**NC-SD38B**		**NC-SD39B**		**NC-SD93B**		**NC-SD42B**		**NC-SD45B**	
EPA Sample No.	(M)B5DQ0		(M)B5DQ2		(M)B5DQ4		(M)B5DQ6		(M)B5DQ8		(M)B5DR0		(M)B5DR2		(M)B5DR6		(M)B5DS0		(M)B5DS2		(M)B5E50		(M)B5DS8		(M)B5DT4	
Date:	3/18/2009		3/19/2009		3/19/2009		3/19/2009		3/19/2009		3/20/2009		3/20/2009		3/20/2009		3/25/2009		3/25/2009		3/25/2009		3/25/2009		3/25/2009	
Depth (feet)	2.0-3.0		4.0-5.5		4.0-6.0		3.5-4.0		3.5-4.0		3.5-4.5		3.5-4.0		4.0-4.5		2.0-3.0		4.0-5.5		4.0-5.5		4.0-6.0		4.0-6.0	
Comments							MS/MSD														Dup. (SD39B)					
Reference(s)	23, p. 48; 24, p. 103; 25, pp. 97, 102		23, p. 50; 24, p. 108; 25, pp. 99, 102		23, p. 50; 24, p. 106; 25, pp. 99, 102		23, p. 50; 24, p. 107; 25, pp. 99, 102		23, p. 50; 24, p. 109; 25, pp. 99, 102		23, p. 53; 24, p. 111; 25, pp. 101-102		23, p. 53; 24, p. 110; 25, pp. 101-102		23, p. 53; 24, p. 112; 25, pp. 101-102		23, p. 58; 24, p. 113; 25, pp. 106, 109		23, p. 58; 24, p. 114; 25, pp. 105, 109		23, p. 58; 24, p. 114; 25, pp. 105, 109		23, p. 58; 24, p. 115; 25, pp. 106, 109		23, p. 59; 24, p. 116; 25, pp. 106, 109	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Antimony																										
Arsenic																							**109**	1.6	**152 J**	2.7
Cadmium	**74.3 J**	1.2	**78.6 J**	1.1	**45.9 J**	1.2	**82.7 J**	1.3	**63.1 J**	1.2	**60.3 J**	1.1	**48.6 J**	1.5	**90.3 J**	1.2	**70.7 J**	1.4	**65.1 J**	1.4	**86.4 J**	1.3			**95.3 J**	1.4
Chromium									**721 J**	2.5					**682 J**	2.4			**703 J**	2.7	**828 J**	2.5			**1,060 J**	2.7
Cobalt																										
Copper	**1,960 J**	6.2	**2,170 J**	5.6	**3,200 J**	6.0	**2,830 J**	6.6	**2,800 J**	6.2	**2,550 J**	5.6	**2,310 J**	7.4	**2,520 J**	5.9	**3,290 J**	7.0	**3,940 J**	6.8	**4,630 J**	6.4	**2,130**	4.1	**7,070 J**	6.8
Lead			**1,440 J**	2.2					**1,070 J**	2.5	**1,050 J**	2.2			**1,630 J**	2.4	**1,230 J**	2.8			**1,100 J**	2.5			**1,220 J**	2.7
Nickel	**808 J**	9.9	**363 J**	9.0	**1,150 J**	9.6	**1,830 J**	10.5	**634 J**	9.9	**637 J**	9.0	**323 J**	11.8	**755 J**	9.5	**558 J**	11.3	**815 J**	10.8	**1,200 J**	10.2	**421**	6.6	**1,490 J**	10.8
Selenium																							**12.6**	5.7		
Zinc	**3,470 J**	14.8	**2,520 J**	13.4	**2,720 J**	14.4	**2,820 J**	15.7	**3,950 J**	14.9	**3,610 J**	13.5	**1,980 J**	17.7	**3,500 J**	14.2	**3,240 J**	16.9	**4,410 J**	16.2	**5,090 J**	15.3	**1,350**	9.8	**7,050 J**	16.3
Reference(s)	38, pp. 3, 7, 19		38, pp. 3, 8, 20		38, pp. 3, 9, 20-21		38, pp. 3, 10, 21		38, pp. 3, 14, 23-24		38, pp. 3, 15, 24		38, pp. 3, 16, 25		38, pp. 3, 17, 25-26		41, pp. 3-5, 20-21		41, pp. 3-4, 6, 21		41, pp. 3-4, 18, 29		41, pp. 3-4, 7, 21-22		41, pp. 3-4, 8, 22-23	
VOCs (ug/kg, dry weight)	Result	SQL			Result	SQL	Result	SQL																		
Acetone																										
Chloroform	**1,600**	1,400																								
Chlorobenzene																										
Isopropylbenzene					**1,300**	1,200	**1,600**	1,300																		
Reference(s)	39, pp. 30, 81				39, pp. 32, 84-85		39, pp. 33, 85-86																			
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL			Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Acetophenone																										
Naphthalene			**620**	410	**2,300**	410	**1,100**	420																		
2-Methylnaphthalene			**2,100**	410	**10,000**	410	**5,700**	420			**790**	390														
1,1'-Biphenyl					**830**	410																				
Acenaphthylene																										
Acenaphthene			**890**	410	**2,500**	410	**570**	420															**4,500**	2,000		
Dibenzofuran					**1,100**	410																				
Fluorene			**1,100**	410	**1,800**	410	**970**	420															**5,800**	2,000		
Phenanthrene	**790**	420	**3,800**	410	**12,000**	410	**9,100**	420	**1,100**	440	**2,200**	390			**830**	400			**3,200**	1,900	**3,000**	830	**7,000**	2,000	**1,600**	420
Anthracene					**960**	410																	**6,500**	2,000	**530**	420
Carbazole																										
Fluoranthene			**1,600**	410	**2,300**	410			**830**	440	**1,400**	390					**660**	450	**2,500**	1,900	**2,000**	830	**16,000**	2,000	**1,300**	420
Pyrene			**2,200**	410	**4,300**	410			**1,100**	440	**1,600**	390							**3,100**	1,900			**21,000 J**	2,000		
Benzo(a)anthracene			**1,100**	410	**1,800**	410			**550**	440	**860**	390									**1,700**	830	**11,000**	2,000	**830**	420
Chrysene			**800**	410	**2,300**	410			**480**	440	**700**	390									**1,200**	830	**11,000**	2,000	**750**	420
Bis(2-ethylhexyl)phthalate			**22,000**	410	**9,400**	410	**6,900**	420	**6,600**	440	**6,900**	390			**2,800**	400	**6,700**	450	**24,000**	1,900	**27,000**	830			**5,700**	420
Benzo(b)fluoranthene			**680**	410	**1,100**	410					**660**	390									**930**	830	**6,500**	2,000	**550**	420
Benzo(k)fluoranthene																										
Benzo(a)pyrene			**580**	410	**1,100**	410															**840**	830	**7,400**	2,000	**580**	420
Indeno(1,2,3-cd)pyrene																							**3,000**	2,000		
Dibenzo(a,h)anthracene																										
Benzo(g,h,i)perylene					**560**	410																	**3,000**	2,000		
Reference(s)	39, pp. 41, 96		39, pp. 43-44, 97-98		39, pp. 47-48, 100-102		39, pp. 51, 104-105		39, pp. 55, 108-109		40, pp. 7-8, 46-47				40, pp. 13, 52-53		44, pp. 19, 127		44, pp. 21, 128-129		44, pp. 43-44, 149		44, pp. 23-24, 130-131		44, pp. 25-26, 132-133	
PCBs (ug/kg, dry weight)	Result	SQL	Result	SQL					Result	SQL	Result	SQL			Result	SQL	Result	SQL	Result	SQL	Result	SQL			Result	SQL
Aroclor-1242	**920**	81	**1,100**	81					**650**	85	**370**	75			**800**	78	**300**	87	**1,500 J**	92	**1,600 J**	81			**660**	82
Aroclor-1254																					**1,600 J**	81				
Reference(s)	39, pp. 67, 117		39, pp. 71, 118						39, pp. 77, 119		40, pp. 18, 56				40, pp. 20, 56		44, pp. 61, 159		44, pp. 62, 95-96, 159		44, pp. 77, 95-96, 163				44, pp. 65, 160	

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 4
Background and Observed Release Concentrations
Subsurface Samples - February-April 2009
Newtown Creek, Brooklyn/Queens, NY

			Observed Release Concentrations (continued)											
SAT2 Sample No.	NC-SD46B		NC-SD47B		NC-SD48B		NC-SD49B		NC-SD50B		NC-SD51B		NC-SD52B	
EPA Sample No.	(M)B5DT6		(M)B5DT8		(M)B5DW0		(M)B5DW2		(M)B5DW4		(M)B5DW6		(M)B5DW8	
Date:	3/25/2009		3/25/2009		3/25/2009		3/31/2009		3/26/2009		3/31/2009		3/26/2009	
Depth (feet)	4.0-6.0		4.0-5.5		4.0-6.0		4.0-6.0		3.0-3.5		4.0-6.0		4.0-5.5	
Comments											MS/MSD			
Reference(s)	23, p. 59; 24, p. 117; 25, pp. 105, 109		23, p. 59; 24, p. 118; 25, pp. 105, 109		23, p. 59; 24, p. 119; 25, pp. 105,		23, p. 64; 24, 9. 123; 25, pp. 118, 127		23, p. 61; 24, p. 120; 25, pp. 109, 113		23, p. 65; 24, p. 124; 25, pp. 118, 127		23, p. 62; 24, p. 121; 25, pp. 109, 115	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Antimony			52.2 J	12.7			54.8 J	13.8	60.3 J	14.6	53.2 J	16.9	101 J	16.7
Arsenic	157 J	2.4	621 J	2.1	191 J	2.7	839 J	2.3	442 J	2.4	284 J	2.8	481 J	2.8
Cadmium	82.4 J	1.2	67.1 J	1.1	99.7 J	1.3	15.4 J	1.1	53.9 J	1.2	125 J	1.4	158 J	1.4
Chromium	875 J	2.4			824 J	2.7			840 J	2.4	900 J	2.8	1,080 J	2.8
Cobalt													77.2 J	13.9
Copper	6,880 J	6.0	10,600 J	15.9	12,200 J	6.7	5,400 J	5.7	34,000 J	60.8	15,600 J	28.2	39,200 J	69.6
Lead	1,090 J	2.4	1,180 J	2.1	1,190 J	2.7	1,490 J	2.3	1,240 J	2.4	1,330 J	2.8	1,550 J	2.8
Nickel	1,640 J	9.6	5,010 J	8.5	1,760 J	10.6	1,140 J	9.2	4,690 J	9.7	4,420 J	11.3	4,570 J	11.1
Selenium							189 J	8.0					35.3 J	9.7
Zinc	5,700 J	14.4	5,200 J	12.7	6,170 J	16.0	3,510 J	13.8	7,020 J	14.6	14,100 J	16.9	10,800 J	16.7
Reference(s)	41, pp. 3-4, 12, 25		41, p. 3, 13, 25-26		41, p. 4, 14, 26		43, pp. 4-5, 24-25		41, p. 4, 15, 27		43, pp. 4, 6, 25		41, p. 4, 16, 27-28	
VOCs (ug/kg, dry weight)											Result	SQL		
Acetone														
Chloroform														
Chlorobenzene											28,000	1,500		
Isopropylbenzene														
Reference(s)											45, pp. 3, 110			
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Acetophenone														
Naphthalene			2,600	1,100			6,900	770	5,700	1,200	1,600	470	920	440
2-Methylnaphthalene			2,700	1,100			5,700	770	4,200	1,200	2,600	470	1,500	440
1,1'-Biphenyl														
Acenaphthylene														
Acenaphthene							2,400	770	1,700	1,200	720	470	730	440
Dibenzofuran														
Fluorene							2,200	770	1,700	1,200	720	470	990	440
Phenanthrene	1,400	360	4,700	1,100	900	360	9,400	770	7,700	1,200	4,200	470	3,800	440
Anthracene							2,300	770	1,900	1,200			560	440
Carbazole														
Fluoranthene	910	360	2,000	1,100	560	360	4,100	770	4,000	1,200	1,300	470	1,500	440
Pyrene							5,300	770	5,300	1,200	2,000	470	2,400	440
Benzo(a)anthracene	570	360					2,200	770	2,300	1,200	750	470	1,000	440
Chrysene	520	360	1,300	1,100			2,200	770	2,500	1,200	810	470	840	440
Bis(2-ethylhexyl)phthalate	7,200	360	3,900	1,100	7,100	360					4,000	470	6,600	440
Benzo(b)fluoranthene							1,800	770	1,500	1,200	570	470	730	440
Benzo(k)fluoranthene														
Benzo(a)pyrene							1,900	770	1,600	1,200	620	470	680	440
Indeno(1,2,3-cd)pyrene							890	770						
Dibenzo(a,h)anthracene														
Benzo(g,h,i)perylene							920	770						
Reference(s)	44, pp. 27, 134		44, pp. 31, 137-138		44, pp. 33, 140		45, pp. 24-25, 140-141		44, pp. 37-38, 142-144		45, pp. 26-27, 141-143		44, pp. 39-40, 144-146	
PCBs (ug/kg, dry weight)	Result	SQL			Result	SQL							Result	SQL
Aroclor-1242	730	71			590	70							1,800 J	86
Aroclor-1254														
Reference(s)	44, pp. 66, 160				44, pp. 69, 161								44, pp. 73, 95-96, 162	

	Observed Release Concentrations (continued)											
SAT2 Sample No.	NC-SD53B		NC-SD54B		NC-SD55B		NC-SD56B		NC-SD57B		NC-SD58B	
EPA Sample No.	(M)B5DX0		(M)B5DX2		(M)B5DX4		(M)B5DX6		(M)B5DX8		(M)B5DY0	
Date:	3/31/2009		3/26/2009		3/31/2009		3/31/2009		3/31/2009		3/31/2009	
Depth (feet)	4.0-5.5		4.0-5.5		4.0-6.0		4.0-6.0		4.0-6.0		4.0-6.0	
Comments												
Reference(s)	23, p. 65; 24, p. 125; 25, pp. 119, 127		23, p. 62; 24, p. 122; 25, pp. 109, 115		23, p. 65; 24, p. 126; 25, pp. 119, 127		23, p. 65; 24, p. 128; 25, pp. 120, 127		23, p. 65; 24, p. 127; 25, pp. 120, 127		23, p. 65; 24, p. 129; 25, pp. 122, 127	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Antimony			53.4 J	16.3			43.5 J	17.3				
Arsenic	198 J	2.4	394 J	2.7	219 J	2.6	348 J	2.9	173 J	3.2	269 J	2.8
Cadmium	168 J	1.2	105 J	1.4	160 J	1.3	94.7 J	1.4	193 J	1.6	252 J	1.4
Chromium	1,090 J	2.4	904 J	2.7	1,230 J	2.6	1,260 J	2.9	1,740 J	3.2	1,880 J	2.8
Cobalt												
Copper	8,180 J	5.9	21,300 J	34.1	10,800 J	6.6	20,400 J	28.8	8,990 J	8.1	11,200 J	7.0
Lead	1,340 J	2.4	1,430 J	2.7	1,540 J	2.6	1,730 J	2.9	1,560 J	3.2	1,630 J	2.8
Nickel	2,510 J	9.5	2,660 J	10.9	2,350 J	10.6	3,960 J	11.5	2,150 J	12.9	2,800 J	11.3
Selenium												
Zinc	8,210 J	14.3	8,310 J	16.3	9,300 J	15.9	10,400 J	17.3	11,900 J	19.4	14,600 J	16.9
Reference(s)	43, pp. 4, 9, 27		41, pp. 4, 17, 28		43, pp. 4, 10, 27-28		43, pp. 4, 11, 28-29		43, pp. 4, 12, 29		43, pp. 4, 13, 29-30	
VOCs (ug/kg, dry weight)	Result	SQL			Result	SQL					Result	SQL
Acetone												
Chloroform												
Chlorobenzene												
Isopropylbenzene	3,600	1,500			9,600	1,400					1,800	1,500
Reference(s)	45, pp. 4, 112				45, pp. 5, 113						45, pp. 9, 119	
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Acetophenone												
Naphthalene	4,700	900	9,400	1,900	86,000	7,100	5,200	960	2,300	530	5,500	920
2-Methylnaphthalene	2,000	900	7,500	1,900	29,000	7,100	4,800	960	1,000	530	8,100	920
1,1'-Biphenyl												
Acenaphthylene												
Acenaphthene	1,100	900	4,200	1,900	9,900	7,100	1,500	960	750	530	4,000	920
Dibenzofuran												
Fluorene			3,800	1,900			1,400	960	560	530	2,700	920
Phenanthrene	3,600	900	16,000	1,900	15,000	7,100	7,000	960	2,400	530	11,000	920
Anthracene			4,100	1,900			1,400	960	620	530	3,300	920
Carbazole												
Fluoranthene	1,500	900	9,400	1,900			3,100	960	910	530	4,900	920
Pyrene	2,400	900	13,000	1,900	8,200	7,100	4,500	960	1,800	530	7,300	920
Benzo(a)anthracene			3,800	1,900			1,900	960	770	530	2,700	920
Chrysene	920	900	4,200	1,900			1,800	960	600	530	2,500	920
Bis(2-ethylhexyl)phthalate	6,300	900	19,000	1,900					6,300	530	5,000	920
Benzo(b)fluoranthene			3,200	1,900			1,500	960	600	530	2,800	920
Benzo(k)fluoranthene												
Benzo(a)pyrene			3,200	1,900			1,700	960	670	530	3,300	920
Indeno(1,2,3-cd)pyrene											1,600	920
Dibenzo(a,h)anthracene												
Benzo(g,h,i)perylene											1,500	920
Reference(s)	45, pp. 28, 143-144		44, pp. 41-42, 146-147		45, pp. 30, 145-146		45, pp. 32-33, 147-148		45, pp. 34-35, 149-150		45, pp. 36-37, 150-152	
PCBs (ug/kg, dry weight)											Result	SQL
Aroclor-1242											1,400 J	89
Aroclor-1254												
Reference(s)											45, pp. 75, 101-102, 176	

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

Table 4
Background and Observed Release Concentrations
Subsurface Samples - February-April 2009
Newtown Creek, Brooklyn/Queens, NY

					Observed Release Concentrations (continued)																					
SAT2 Sample No.	NC-SD59B		NC-SD60B		NC-SD63B		NC-SD94B		NC-SD65B		NC-SD67B		NC-SD68B		NC-SD69B		NC-SD71B		NC-SD74B		NC-SD75B		NC-SD76B		NC-SD92B	
EPA Sample No.	(M)B5DY2		(M)B5DY4		(M)B5DZ0		(M)B5E52		(M)B5DZ4		(M)B5DZ8		(M)B5E00		(M)B5E02		(M)B5E06		(M)B5E12		(M)B5E14		(M)B5E16		(M)B5E48	
Date:	3/31/2009		3/31/2009		4/1/2009		4/1/2009		4/1/2009		3/31/2009		4/1/2009		4/1/2009		4/1/2009		3/16/2009		3/16/2009		3/16/2009		3/16/2009	
Depth (feet)	4.0-5.5		4.0-5.5		4.0-6.0		4.0-6.0		4.0-6.0		4.0-6.0		3.5-4.5		4.0-5.5		3.5-4.0		4.0-4.5		3.5-4.0		4.0-6.0		4.0-6.0	
Comments							Dup. (SD63B)										MS/MSD								Dup. (SD76B)	
Reference(s)	23, p. 66; 24, p. 131; 25, pp. 122, 127		23, p. 65; 24, p. 130; 25, pp. 123, 127		23, p. 67; 24, p. 133; 25, pp. 124, 127		23, p. 67; 24, p. 133; 25, pp. 124, 128		23, p. 67; 24, p. 134; 25, pp. 124, 127		23, p. 66; 24, p. 132; 25, pp. 123, 128		23, p. 68; 24, p. 135; 25, pp. 126, 128		23, p.69; 24, p. 137; 25, pp. 126, 128		23, p. 68; 24, p. 136; 25, pp. 125, 128		23, p. 41; 24, p. 97; 25, pp. 90, 93		23, p. 40; 24, p. 94; 25, pp. 90, 93		23, p. 41; 24, p. 95; 25, pp. 90, 93		23, p. 41; 24, p. 95; 25, pp. 90, 93	
Metals (mg/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL
Antimony			**53.6 J**	19.3	**49.6 J**	18.0	**46.8 J**	17.9	**49.3 J**	18.9			**52.9 J**	18.1	**59.8 J**	18.9	**40.2 J**	17.1								
Arsenic	**316 J**	2.1	**476 J**	3.2	**171 J**	3.0	**176 J**	3.0	**150 J**	3.1			**205 J**	3.0												
Cadmium			**28.9 J**	1.6	**314 J**	1.5	**299 J**	1.5	**342 J**	1.6	**15.5 J**	1.1	**29 J**	1.5	**464 J**	1.6	**338 J**	1.4	**93 J**	1.4			**87.2 J**	1.3	**76.9 J**	1.3
Chromium					**2,970 J**	3.0	**2,970 J**	3.0	**3,720 J**	3.1					**2,000 J**	3.1	**1,540 J**	2.9	**768 J**	2.8			**699 J**	2.6		
Cobalt																										
Copper	**2,500 J**	5.3	**4,830 J**	8.0	**6,070 J**	7.5	**6,480 J**	7.5	**6,040 J**	7.9	**3,760 J**	5.4	**2,040 J**	7.5	**5,380 J**	7.9	**4,380 J**	7.1	**2,160 J**	6.9	**1,010 J**	6.5	**2,600 J**	6.5	**2,470 J**	6.4
Lead			**1,610 J**	3.2	**1,730 J**	3.0	**1,820 J**	3.0	**2,400 J**	3.1			**1,750 J**	3.0	**2,020 J**	3.1	**1,810 J**	2.9			**1,170 J**	2.6	**1,380 J**	2.6	**1,450 J**	2.6
Nickel	**413 J**	8.5	**1,480 J**	12.9	**2,780 J**	12.0	**3,030 J**	11.9	**2,770 J**	12.6	**343 J**	8.6	**515 J**	12.0	**2,100 J**	12.6	**1,430 J**	11.4	**809 J**	11.0	**392 J**	10.3	**662 J**	10.3	**579 J**	10.2
Selenium	**58 J**	7.4																								
Zinc			**5,220 J**	19.3	**30,200 J**	71.9	**26,600 J**	71.6	**40,700 J**	75.4			**4,250 J**	18.1	**8,860 J**	18.9	**6,980 J**	17.1	**3,480 J**	16.6			**4,050 J**	15.5	**3,440 J**	15.4
Reference(s)	43, pp. 4, 14, 30		43, pp. 4, 15, 31		43, pp. 4, 16, 31-32		43, pp. 4, 22, 35-36		43, pp. 4, 17, 32		43, pp. 4, 18, 33		43, pp. 4, 19, 33-34		43, pp. 4, 20, 34		43, pp. 4, 21, 34-35		42, pp. 12, 18-19, 27		42, pp. 13, 18-19, 27-28		42, pp. 14, 18-19, 28		42, pp. 15, 18-19, 28-29	
VOCs (ug/kg, dry weight)											Result	SQL	Result	SQL			Result	SQL								
Acetone																	**3,300**	2,900								
Chloroform																										
Chlorobenzene																										
Isopropylbenzene											**7,400**	1,300	**1,900**	1,900												
Reference(s)											45, pp. 14, 126		45, pp. 15, 128				45, pp. 17, 130									
SVOCs (ug/kg, dry weight)	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL	Result	SQL			Result	SQL	Result	SQL	Result	SQL
Acetophenone																										
Naphthalene	**1,600**	750	**61,000**	7,700			**1,600**	1,000			**78,000**	8,300	**85,000**	11,000	**1,800**	1,100					**1,100**	430	**520**	400		
2-Methylnaphthalene	**1,600**	750	**31,000**	7,700	**2,700**	1,500	**2,400**	1,000	**1,500**	1,000	**28,000**	8,300	**18,000**	11,000	**1,700**	1,100					**1,200**	430				
1,1'-Biphenyl																										
Acenaphthylene																										
Acenaphthene	**1,500**	750	**12,000**	7,700							**9,200**	8,300									**1,100**	430	**650**	400		
Dibenzofuran																					**820**	430				
Fluorene	**1,500**	750																			**1,500**	430	**850**	400		
Phenanthrene	**6,000**	750	**24,000**	7,700	**4,300**	1,500	**4,700**	1,000	**2,600**	1,000	**32,000**	8,300	**36,000**	11,000	**3,100**	1,100	**5,000**	1,900			**7,500**	430	**2,900**	400	**510**	410
Anthracene	**1,500**	750	**8,300**	7,700							**11,000**	8,300	**14,000**	11,000							**2,500**	430				
Carbazole																										
Fluoranthene	**2,800**	750	**8,100**	7,700	**1,900**	1,500	**1,700**	1,000			**15,000**	8,300	**30,000**	11,000	**1,200**	1,100	**5,300**	1,900			**6,500**	430	**2,400**	400	**650**	410
Pyrene	**3,700**	750	**14,000**	7,700	**4,000**	1,500	**2,900**	1,000	**1,800**	1,000	**22,000**	8,300	**34,000**	11,000	**2,200**	1,100	**5,300**	1,900			**4,200**	430	**3,100**	400	**680**	410
Benzo(a)anthracene	**1,700**	750					**1,000**	1,000			**9,700**	8,300	**20,000**	11,000			**2,300**	1,900			**2,200**	430	**1,500**	400		
Chrysene	**1,500**	750					**1,000**	1,000			**9,000**	8,300	**17,000**	11,000							**2,000**	430	**1,300**	400		
Bis(2-ethylhexyl)phthalate					**11,000**	1,500	**6,800**	1,000	**7,700**	1,000					**6,400**	1,100	**12,000**	1,900					**9,100**	400		
Benzo(b)fluoranthene	**1,000**	750											**29,000 J**	11,000							**1,200**	430	**1,200**	400		
Benzo(k)fluoranthene																										
Benzo(a)pyrene	**1,200**	750											**21,000**	11,000							**950**	430	**850**	400		
Indeno(1,2,3-cd)pyrene													**13,000**	11,000									**570**	400		
Dibenzo(a,h)anthracene																										
Benzo(g,h,i)perylene																							**520**	400		
Reference(s)	45, pp. 38-39, 152-153		45, pp. 40, 154-155		45, pp. 42, 156-157		45, pp. 54, 167-168		45, pp. 45, 158-159		45, pp. 46, 159-161		45, pp. 48-49, 161-163		45, pp. 50, 163-164		45, pp. 52, 166				46, pp. 64-65, 240-241		46, pp. 68-69, 243-244		46, pp. 72, 247-248	
PCBs (ug/kg, dry weight)																			Result	SQL			Result	SQL	Result	SQL
Aroclor-1242																			**240**	89			**470**	77	**200**	79
Aroclor-1254																										
Reference(s)																			46, pp. 103, 259				46, pp. 105, 259		46, pp. 106, 259	

CRQL - Contract required quantitation limit
SQL - Sample quantitation limit
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram

U - not detected
J - estimated concentration

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A source hazardous waste quantity; therefore, hazardous constituent quantity is not scored (NS).

Hazardous Constituent Quantity (C) Value: NS

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B source hazardous waste quantity; therefore, hazardous wastestream quantity is not scored.

Hazardous Wastestream Quantity (W) Value: NS

2.4.2.1.3 Volume

Analytical results for the February-April 2009 sampling event, as well as previous sampling events, show that contaminated sediments are located throughout Newtown Creek [see Sections 2.2.1 and 2.4.1]. The creek and its branches have a total surface area of approximately 165 to 170 acres [Ref. 12, p. 53; 13, p. 2]. For the purpose of this calculation, EPA uses the more conservative value of 165 acres (i.e., approximately 7,187,400 square feet). The top depth of contaminated subsurface samples ranged from 2 to 4 feet, with a majority of the samples having a top depth of 4 feet [see Table 2]. Based on the top-depth values, the column of contaminated sediments averages approximately 3.7 feet. The volume of contaminated sediments in Newtown Creek is calculated as follows:

$$\text{Volume (yd}^3) = (7{,}187{,}400\ \text{ft}^2 \times 3.7\ \text{ft}) \div (27\ \text{ft}^3/\ \text{yd}^3) = 984{,}940\ \text{yd}^3$$

This is considered to be a conservative (i.e., low) estimate since EPA did not delineate the full vertical extent of contamination. The source type is ‘Other’, so the volume value is divided by 2.5 to obtain the assigned value, as shown below [Ref. 1, p. 51591, Section 2.4.2.1.3, Table 2-5].

Dimension of source (yd^3): 984,940
Volume (V) Assigned Value: 984,940/2.5 = 393,976

2.4.2.1.4 Area

Tier D is not evaluated for source type “other” [Ref. 1, p. 51591, Table 2-5, Section 2.4.2.1.4].

Area of source (ft^2): N/A
Area (A) Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source 1 is 393,976 for Tier C - Volume [Ref. 1, p. 51591].

Source Hazardous Waste Quantity Value: 393,976

SITE SUMMARY OF SOURCE DESCRIPTIONS

		Containment			
Source Number	Source Hazardous Waste Quantity Value	Ground Water	Surface Water	Air Gas	Air Particulate
1	393,976	NS	10 *	NS	NS

NS = Not Scored

* The overland flow containment factor is 10 for the source [see Section 2.2.1].

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

Newtown Creek is a tidal arm of the New York-New Jersey Harbor Estuary that forms the northwestern-most border between the New York City boroughs of Brooklyn and Queens [Figures 1 and 2 of this HRS documentation record; Ref. 4, p. 1; 6, p. 1; 7, p. 3; 8, pp. 9-10; 9, p. 3; 10, pp. 6-7]. It is tributary to the East River and includes five branches along its 3.5- to 4.3-mile reach: (from east to west) English Kills, East Branch, Maspeth Creek, Whale Creek, and Dutch Kills [Ref. 4, p. 1; 6, p. 1; 7, p. 5; 8, p. 10; 9, p. 3; 11, p. 11; 12, pp. 52-53]. The creek and its branches have a total surface area of approximately 165 to 170 acres [Ref. 12, p. 53; 13, p. 2]. Urban development cut off natural freshwater flow to Newtown Creek, and current flow into the creek consists exclusively of storm water runoff, CSOs, permitted and unpermitted discharges, and ground water migration. The creek rises and falls with the tide, but it is mostly stagnant [Ref. 6, pp. 1-2; 8, pp. 9-10; 9, pp. 4-5, 8; 11, pp. 11-12, 21-22; 12, pp. 21-22]. Newtown Creek is a navigable waterway, and the channel must be maintained for shipping purposes [Ref. 9, p. 6; 15, p. 1]. NYSDEC classifies it as Class SD saline surface water, which should be suitable for fishing and fish survival oxygen [Ref. 11, p. 11; 12, pp. 22, 40]. However, testing by NYCDEP indicates that Newtown Creek does not always comply with the Class SD fish survival standard for dissolved oxygen [Ref. 12, pp. 22-23, 355-356]. NYCDEP has reported salinity measurements ranging from 18.5 to 22.8 parts per thousand (ppt) for Newtown Creek in the vicinity of Kosciuszko Bridge, which carries the Brooklyn-Queens Expressway, making it brackish water [Figure 1 of this HRS documentation record; Ref. 52, p. 112].

The English Kills portion of Newtown Creek originates near the Montrose Avenue Swing Bridge in Brooklyn, and then flows north-northwest for approximately 3.5 to 4.3 miles into the East River [Figures 1 and 2 of this HRS documentation record]. Due to the tidal nature of the site and surroundings, the 15-mile target distance limit (TDL) begins at the center of the area of observed sediment contamination and extends out to the East River [Ref. 1, p. 51605]. The TDL branches out from that confluence and into several water bodies, including Harlem River, Hudson River, Long Island Sound, Upper Bay, the Narrows, Lower Bay, Kill Van Kull, and Newark Bay [Ref. 54, p. 1]. All of these water bodies are part of the core area of the New York-New Jersey Harbor Estuary, which was designated as an “Estuary of National Significance” by EPA in 1988 [Ref. 10, pp. 5-7].

The Newtown Creek site is scored by the following approach:

> The threats being evaluated are the Surface Water Pathway Human Food Chain and Environmental Threats.
>
> An observed release by chemical analysis is documented throughout Newtown Creek, and the hazardous substances present include metals, VOCs, PAHs, and PCBs [see Section 2.2].
>
> Since the source is contaminated sediments in the waterway, the entire area of the contaminated sediment source is the probable point of entry (PPE).
>
> The known zone of contamination extends from the navigable portion of English Kills (samples NC-SD71A and NC-SD71B) to the East River (samples NC-SD01A and NC-SD01B), approximately 3 miles downstream [see Figure 2].
>
> Targets subject to actual contamination include the Newtown Creek fishery [Section 4.1.3.3] and the New York-New Jersey Harbor Estuary [Section 4.1.4.3].

4.1.2.1 Likelihood of Release

4.1.2.1.1 Observed Release

Direct Observation

An observed release by direct observation is not being scored.

Chemical Analysis

An observed release by chemical analysis is documented in Newtown Creek between sample location NC-SD71A in English Kills and sample location NC-SD01B, approximately 3 miles downstream [see Section 2.2].

Attribution

Sediments in Newtown Creek are contaminated with metals, VOCs, SVOCs including PAHs, and PCBs for a length of more than 3 miles [see Section 2.2]. The origin of these hazardous substances in the contaminated sediments has not been identified due to the presence of multiple possible sources for each substance. There are numerous routes that contamination can be taking to reach the water body and underlying sediments, including spillage during product shipping and handling, direct disposal and discharge, storm water runoff, and air deposition. As a result, the source(s) of all the contamination in any particular location in the creek cannot be determined.

The contaminants detected in the creek sediments can come from a wide variety of industrial and other anthropogenic activities [Ref. 9, pp. 3-6; 11, pp. 12, 20-24; 12, pp. 21-22; 13, pp. 3-6]. For instance, more than 30 different types of source contributing PAHs to the New York/New Jersey Harbor watershed have been identified [Ref. 55, p. 50]. Possible PAH sources include transportation-related activities such as petroleum spills, vehicle exhaust, and tire wear; creosote-treated marine pilings, utility poles, and railroad ties; and contaminated properties including MGPs [Ref. 55, pp. 21, 50, 85-86]. Likewise, cadmium could be attributed to the widespread use and disposal of nickel-cadmium (Ni-Cd) batteries, application of fertilizers and biosolids with subsequent runoff, or contaminated properties [Ref. 56, pp. 12-15]. CSOs and storm water runoff are major contributors of PCBs to the Harbor, with a variety of contaminated properties or facilities as the likely contributors to those wastestreams [Ref. 57, p. 18]. Metals (including copper), PCBs, SVOCs, and VOCs have all been detected at concentrations exceeding surface water quality criteria in CSO and storm water discharges to Newtown Creek [Ref. 11, pp. 23-24]. EPA identified hundreds of potential contamination sources of hazardous substances in the Newtown Creek watershed [Ref. 58, pp. 3-4, 6-68, 72]. In addition, the sediments in Newtown Creek are constantly being disturbed and transported by tidal influx, storm water and CSO flow surges, and dredging for navigational purposes [Ref. 8, p. 10; 9, p. 4; 11, pp. 11, 21-22; 12, p. 22]. As discussed below, there are numerous possible contributors to the sediment contamination that affects Newtown Creek.

Newtown Creek is surrounded by active and vacant industrial use along its length, with residential neighborhoods generally set back a few blocks [Ref. 9, pp. 3-4]. With the exception of a few rezoned portions, the entire waterfront (160 properties) is zoned M3 for heavy manufacturing and industrial uses [Ref. 7, p. 4; 9, p. 6; 12, p. 59; 14, p. 6]. The waterfront and surrounding properties have been heavily industrialized since the 1850s. Historical or current industrial activities along and within the creek have included oil refining, storage, and distribution; copper smelting; waste oil, scrap metal, soil, and concrete recycling; petrochemical, chemical, paint, fertilizer, glue, and dry ice manufacture; energy production at MGPs and natural gas facilities; shipbuilding and aluminum manufacture for airplanes; cement production; lumber and coal storage; fat rendering, hide tanning, sugar refining, and canning; and transport of fuel, raw materials, and products [Ref. 7, pp. 1, 3, 7, 13; 8, p. 10; 9, pp. 4-6; 11, pp. 12-16; 13, pp. 1-5; 14, pp. 7-8; 16, p. 3; 17, p. 5; 18, pp. 6, 11-12]. In addition, discharge of raw sewage directly into the water occurred from 1865 to 1967. Although there have been upgrades to the Newtown Creek WPCP, there are still 23 permitted CSO discharges and more than 100 other storm water or industrial discharges to the creek [Ref. 6, p. 1; 8, p. 10; 9, pp. 4, 8; 11, pp. 11, 20-22, 103; 12, pp. 21, 52, 96-102; 20, pp. 1-4]. The creek is also home to the largest urban oil spill in North American history (i.e., the Greenpoint oil spill) [Ref. 7, pp. 5, 13-14, 18; 11, p. 21; 13, pp. 3-5; 16, p. 3-4, 17-34]. An illegal discharge of white sediment from a cement plant into the waterway was found to be high in calcium [Ref. 7, p. 7].

Numerous past investigations with varying scopes have been conducted within and around Newtown Creek, with most of the focus on specific properties or specific segments of the creek [Ref. 8, pp. 15-21; 11, pp. 7, 97, 104-113; 14, pp. 5-18, 38-40; 16, pp. 2-4; 17, pp. 4, 33-34; 18, pp. 13-14, 51; 19, pp. 1-3]. Some of these studies have shown the presence of various contaminants at elevated levels in the creek sediments. Historical NYCDEP sediment sampling data indicate high concentrations of metals, VOCs, SVOCs, and PCBs [Ref. 11, pp. 27-28, 180-183]. Sediment sampling by PDRC from March 2004 to August 2005 showed percent levels (i.e., greater than 10,000 mg/kg) of copper and zinc, and PCBs up to 106,000 µg/kg. Other metals, pesticides, and PAHs were also detected above screening criteria. The pattern of contamination indicates that contaminants from various sources are intermingled within the Newtown Creek sediments [Ref. 11, pp. 7, 29-43, 60-65, 105-113, 138-152, 1005-1032, 1055-1097]. Those previous investigations, as well as analytical results for the February-April 2009 EPA sampling event, show that the contaminants are located throughout Newtown Creek [see Section 2.2]. The contaminants may have entered Newtown Creek via several transport pathways or mechanisms, including spillage, direct disposal or discharge, contaminated ground water discharge, or storm water runoff [Ref. 9, pp. 4, 6; 11, pp. 20-24; 12, pp. 21-22].

EPA completed an extensive study of possible contamination sources in September 2008. In addition to standard environmental record sources, EPA also conducted a proprietary database search of former MGPs. Searches of Federal and State environmental databases indicate that there are hundreds of possible contamination sources in the vicinity of Newtown Creek. Listed are oil refineries and depots, former MGPs, chemical plants, manufacturing facilities, rail yards, auto repair shops, tank cleaning companies, recycling and waste management facilities, various commercial enterprises, and facilities operated by various State and City agencies [Ref. 58, pp. 3-4, 6-68, 72].

In February 2007, New York State filed a Notice of Intent to sue Phelps Dodge Corporation, Keyspan Corporation, and several oil companies for violating Resource Conservation and Recovery Act (RCRA) provisions by contributing to imminent and substantial endangerment to health and the environment in Newtown Creek and portions of the adjacent shoreline [Ref. 13, pp. 2-6]. In July and August 2008, the U.S. Congress and Senate asked EPA to evaluate the Newtown Creek site for Superfund status and investigate four specific facilities along the creek [Ref. 59, pp. 1-6; 60, p. 1]. Preliminary testing and a variety of remedial measures have been completed at all four facilities, and NYSDEC continues to oversee the cleanup efforts (see discussions below). Following is a discussion of those four facilities, as well as the Greenpoint Petroleum Remediation Project. **While these facilities or properties are thought to be contributing to the contamination in the creek, they are not thought to be the only sources of contamination.** Brief descriptions of the facilities and associated investigations are provided below:

Phelps Dodge

The Phelps Dodge site (a.k.a. the Laurel Hill site) is a former copper smelting and chemical production facility located at 42-02 56th Road in the Maspeth section of Queens [Ref. 13, p. 5; 14, pp. 6-8]. The 35.2-acre property abuts Newtown Creek at the Maspeth Creek tributary and is situated in a heavily industrialized area [Ref. 14, p. 6]. The Long Island Railroad (LIRR) runs through the property from east to west, dividing it into northern and southern sections. The property is bordered to the west, north, and east by commercial and industrial businesses [Ref. 14, p. 6].

Industrial operations at the Laurel Hill site occurred from approximately 1888 until 1983. Operations through the years included copper smelting, phosphate and sulfuric acid production, lead and aluminum ore processing, silver and nickel refining, and copper sulfate production. The southern portion of the site, originally part of Newtown Creek, was filled in to expand the property during the late 1800s-early 1900s. PDRC purchased the property and business in the late 1920s, expanded operations, and undertook significant rebuilding operations until 1936. The company discontinued smelting operations in approximately 1960 and razed the associated buildings in the early 1960s. Manufacturing operations were discontinued in 1983, and PDRC removed equipment and cleaned out the buildings in 1984. The U.S. Postal Service (USPS) purchased the property in 1986, but PDRC reacquired the property in 1997. All remaining buildings and structures were razed to ground level from September 1999 to June 2000 [Ref. 14, pp. 7-8].

Prior to the 1970s, it is suspected that wastewater generated from some operations at the Laurel Hill site might have been discharged into Newtown Creek. In the 1970s, wastewater treatment consisting of neutralization, settling, and filtration began. Metal hydroxide sludge from the wastewater treatment system was dewatered in unlined lagoons before being shipped off site for reclamation. Furnace slag was used to fill in wet areas of the property and portions of the adjacent creeks [Ref. 14, p. 8].

NYSDEC added the Laurel Hill site to its Registry of Inactive Hazardous Waste Disposal Sites in 1980. In December 1986, NYSDEC classified the site as a significant threat to public health and the environment [Ref. 14, p. 8]. Investigation and sampling activities conducted at the site from 1985 to the present have indicated the presence of heavy metals, SVOCs including PAHs, and PCBs in on-site soil, as well as heavy metals, VOCs, and SVOCs in on-site ground water [Ref. 14, pp. 8-16]. From 1987 to 2002, PDRC entered into various consent orders with NYSDEC to govern cleanup of the Laurel Hill site [Ref. 14, p. 19]. PDRC has remediated land-based contamination, including removal of toxic hotspots [Ref. 11, pp. 16-19]. The effort has enabled partial redevelopment of the property with a big-box store [Ref. 59, p. 3]. The investigation of the extent of contamination in Newtown Creek is underway, but no creek-based remediation has yet been performed [Ref. 59, p. 3]. Sampling efforts to date have indicated that elevated levels of heavy metals and other contaminants are present in Newtown Creek sediments in the vicinity of the Laurel Hill site, but the pattern of contamination indicates that there are other sources of contamination [Ref. 11, pp. 29-43, 60-65, 105-113, 138-152, 1005-1032, 1055-1097].

BCF Oil

The 1.9-acre BCF Oil property is a former petroleum distribution and waste oil recycling facility located at 360-362 Maspeth Avenue in Brooklyn, on the northern bank of English Kills. The property is bordered by the Greenpoint Energy Center to the north, the Ditmas Oil Associates facility (a former gasoline and fuel oil distribution terminal that is currently an automobile impound lot) to the east, and light industrial and manufacturing supply facilities to the west [Ref. 17, pp. 5, 33-34]. Based on historical maps, the BCF property was created by filling of an embayment along the shoreline sometime after 1907 [Ref. 17, p. 5]. By 1933, a petroleum distribution terminal was operating at the property [Ref. 17, p. 5]. The terminal was modified to a waste oil processing facility in 1980, and it was used by Calleia Brothers, Inc., and BCF Oil Refining, Inc., for waste oil recycling until it closed in August 1994 [Ref. 17, pp. 5-6]. In April 1994, BCF Oil identified oil products containing halogenated solvents and PCBs in 19 of 21 on-site storage tanks and associated piping. Measurements and analytical testing of the tank contents in 1995 and 1997 confirmed the presence of PCBs (Arochlor 1242 and 1260) and halogenated solvents, including trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1,1-trichloroethane (TCA), dichlorofluoromethane, and trichlorofluoromethane [Ref. 17, p. 6].

Investigation and sampling activities conducted at the BCF Oil property from 1992 until 1998 indicated the presence of operations-related contaminants in soil and ground water. Six monitoring wells were installed in January 1992, and a seventh monitoring well was installed sometime before 1998. Ground water samples collected from the wells in 1992 and 1998 indicated the presence of non-aqueous phase liquid (NAPL) and VOCs. The NAPL was reported to be a mixture of gasoline and light-weight fuel oils. The results of a subsurface investigation conducted in April 1998 indicated the presence of VOCs, SVOCs including PAHs, PCBs, and metals in on-site soils. Based on the investigation results and the large volume of contaminated waste oil remaining at the facility (more than 550,000 gallons), NYSDEC asked EPA to conduct an emergency removal action [Ref. 17, pp. 5-7].

Beginning in May 2000, EPA conducted an emergency response action at the BCF Oil facility to address concerns about possible leakage from abandoned underground storage tanks (UST), aboveground storage tanks (AST), and drums. By October 2001, EPA had removed more than 800,000 gallons of PCB-contaminated oil, wastewater, and sludge; cleaned and closed-in-place the ASTs and USTs; and recycled approximately 65,000 pounds of scrap metal from the property. VOCs, PCBs, and metals were detected in on-site soil samples, while VOCs were detected in ground water samples. PCBs were detected in a seep sediment sample collected at the edge of English Kills. During a May 2005 inspection, sheens were observed on the surface of English Kills and on exposed sediments along the shoreline, and the presence of light non-aqueous phase liquid (LNAPL) in on-site monitoring wells was confirmed [Ref. 17, pp. 7-8]. The current owner of the BCF Oil property, Newtown Development, LLC (NDL), completed demolition of all aboveground structures at the facility in 2007 [Ref. 17, p. 5; 61, p. 5].

In September and October 2007, NYSDEC conducted Demonstration of Method Applicability (DMA) field activities as part of a Remedial Investigation and Feasibility Study (RI/FS) to assess the nature and extent of the release of oil products containing PCBs. NYSDEC confirmed the presence of LNAPL in on-site monitoring wells [Ref. 61, p. 45]. PCBs were detected in on-site soils, as well as in shoreline sediment and pore water samples [Ref. 17, p. 8; 61, pp. 4, 8-14, 31-35, 41-43]. The results indicated that other sources might be contributing to the PCB contamination in the sediments [Ref. 61, p. 19]. In September 2008, NYSDEC prepared the RI/FS Work Plan for the property [Ref. 17, p. 1].

NYSDEC aims to use the Triad approach to further characterize the contamination, close identified data gaps, and obtain the data necessary to design an efficient and cost-effective remedial strategy [Ref. 17, pp. 1, 4, 11-14]. The BCF Oil property is currently being redeveloped as an automobile impound lot [Ref. 17, pp. 5, 10].

Quanta Resources

The Quanta Resources property located at 37-80 Review Avenue in Long Island City, Queens has been used for a variety of industrial purposes since the late 19th century. The 1.8-acre parcel is bounded on the northwest by Preston Street, on the southwest by the Southern Line of the LIRR, on the southeast by a property currently owned by an imported beer distributor, and on the northeast by Review Avenue. Farther to the northeast across Review Avenue is the Calvary Cemetery [Ref. 62, pp. 3, 21-22].

The earliest recorded owner of the Quanta property was American Agricultural Chemical Company. In 1931, the property was transferred to Triplex Oil, which used the property for refining used crankcase oil until approximately 1971. From 1972 to 1980, the facility was operated by several different owners. Quanta Resources acquired the Review Avenue property in 1980, used the facility to refine used crankcase oil and other liquids, filed for bankruptcy in October 1981, and abandoned the property in November 1981. It is suspected that most of the contamination at the facility resulted from leaking pipes and improper storage of waste oils, which were most heavily concentrated in the tank farm area located in the northeastern portion of the property [Ref. 62, p. 4].

In 1982, NYCDEP completed an emergency removal action to address the immediate risks posed at the Quanta Resources property (i.e., various waste materials left behind in tanks and other structures). More than 500,000 gallons of liquids and approximately 900 cubic yards of solids were removed from the property. The removed materials contained PCBs, chlorinated solvents, heavy metals, and cyanide. Following the emergency removal action, facility structures, (i.e., buildings, ASTs, USTs, piping, and separators) were decontaminated [Ref. 62, p. 4].

The Quanta Resources property was subsequently classified as a Class 2 site because hazardous waste at the facility presented a significant threat to the public health or the environment. NYSDEC initiated an RI/FS to determine whether the surface soil, subsurface soil, ground water or soil vapor contained contamination at levels of concern. VOCs, SVOCs, PCBs, and metals were detected in soil, ground water, and soil gas samples throughout the property. Weathered petroleum in the form of LNAPL, presumed to be mostly from spills and leaks during the oil refining operations, was determined to be present on the water table under the entire property and the property to the northwest. NYSDEC has proposed a remedial strategy at the Quanta Resources property involving area-wide LNAPL recovery via a combination of single-phase vacuum enhanced recovery and localized soil heating enhancement methods. A parking lot is proposed for the Quanta Resources property [Ref. 62, pp. 3-20, 22].

National Grid

National Grid (formerly KeySpan and Brooklyn Union Gas) operates the Greenpoint Energy Center located at 287 Maspeth Avenue in Brooklyn, adjacent to Newtown Creek [Ref. 13, p. 5; 59, pp. 1, 4]. The facility functioned as a large MGP and byproduct coking operation from 1928 until 1952, was converted to an LNG plant in 1968 with various additions over the years, and continues to serve as a major energy supplier for New York City [Ref. 18, pp. 6, 11-12]. National Grid has owned and operated two other properties interconnected with the Greenpoint Energy Center and in close proximity to Newtown Creek: the Equity Works MGP facility at Maspeth Avenue and the Scholes Street Holder Station facility at 338 and 350 Scholes Street [Ref. 59, p. 4].

According to New York State, National Grid's operations at the three aforementioned facilities resulted in the release of arsenic, metals, PCBs, petroleum products, VOCs, chlorinated solvents, SVOCs, and ferro-ferric cyanide complexes. These wastes are present in soil and ground water at the National Grid facilities, and have entered the surface water and sediments of Newtown Creek. The contaminated soil, ground water, and sediments are believed by New York State to serve as a continuing source of contaminant releases to Newtown Creek [Ref. 13, p. 5]. Former MGPs are considered to be likely sources of PAHs, which have been detected at high concentrations in one sediment sample collected near the National Grid property [Ref. 11, pp. 61, 461-464, 1138; 55, pp. 85-86].

National Grid has entered into Voluntary Cleanup Agreement Number V-006312 with NYSDEC to remediate the northeast corner of the Greenpoint Energy Center [Ref. 18, p. 9; 64, pp. 6, 8]. The company performed remedial investigation activities in the northeast corner of the facility between March 2004 and January 2005, and submitted an Interim Remedial Action Work Plan (IRAWP) in March 2005 [Ref. 63, pp. 1-2, 7-9]. Arsenic, PAHs, and VOCs were detected above risk screening criteria in soil and ground water samples collected at the property [Ref. 63, pp. 22-36]. National Grid implemented interim remedial measures (IRM) in the northeast corner of the facility from April to June 2005, submitted the Final IRM Completion Report in June 2006, and submitted a Supplemental Site Investigation and IRM Work Plan in August 2006 [Ref. 18, pp. 1, 6-8; 64, pp. 1-3].

Greenpoint Petroleum Remediation Project

Brooklyn's northwestern-most neighborhood, Greenpoint, has been home to large quantity petroleum storage and refining since the 1860s [Ref. 16, p. 2]. By 1870, the neighborhood had more than 50 refineries along the banks of Newtown Creek [Ref. 65, p. 1]. Much of the oil storage and refining activities occurred in an area where Newtown Creek had been partially filled [Ref. 16, p. 2]. In 1892, the majority of the area refineries were purchased and consolidated by the Standard Oil Trust [Ref. 16, p. 2]. The consolidated operation ultimately became the Mobil Brooklyn Refinery [Ref. 16, p. 2]. Petroleum refining continued at the facility until 1966, when Mobil ceased operating, demolished the refinery, and sold significant portions of the property [Ref. 16, pp. 2-3]. Mobil (now ExxonMobil) continued to use a portion of the property as a petroleum bulk storage terminal until 1993, and BP America Inc. still uses a portion of the property for bulk fuel storage [Ref. 16, pp. 2-3].

In September 1978, the U.S. Coast Guard (USCG) observed signs of an oil spill entering Newtown Creek in the vicinity of the former Greenpoint refinery [Ref. 16, p. 3; 66, p. 1]. A subsequent investigation concluded that the oil spill, which is believed to have begun in the 1950s, covered more than 52 acres of shorefront property between the Greenpoint Avenue Bridge and Kosciusko Bridge [Ref. 16, p. 3]. In 1979, the total spill volume was estimated at approximately 17 million gallons of petroleum product [Ref. 16, p. 3]. More recent estimates are as high as 30 million gallons spilled [Ref. 16, p. 4]. Recovery of subsurface petroleum began in 1979 and continues to this day [Ref. 16, p. 3. NYSDEC currently has a consent decree agreement with ExxonMobil and other parties to clean up the historic oil spill [Ref. 16, p. 3]. As of January 2009, approximately 10 million gallons of petroleum had been recovered and more than 3.5 billion gallons of contaminated ground water had been extracted and treated [Ref. 65, p. 2; 66, p. 2].

The cleanup activities surrounding the historic Greenpoint oil spill involve multiple properties and potentially responsible parties (PRP), and are collectively overseen by NYSDEC as the Greenpoint Petroleum Remediation Project (GPRP). The properties managed under the GPRP include the Former ExxonMobil Terminal (S224088); the Former Paragon Oil Terminal (S224083); the BP Amoco Terminal (S224082); the Apollo Street Creek Parcels (S224122) and the ExxonMobil Off-Site Plume (S224087). The Off-Site Plume consists of areas impacted by the petroleum release, including a residential neighborhood, located south of historical distribution points along Newtown Creek. NYSDEC continues to work with the PRPs to improve the effectiveness of the remedial actions at these properties [Ref. 19, p. 1; 65, pp. 1-3; 66, pp. 1-2].

Hazardous Substances Released:

Acenaphthene	Acenaphthylene	Acetone
Acetophenone	Anthracene	Antimony
Arsenic	Benz(a)anthracene	Benzo(a)pyrene
Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(j,k)fluorene [Fluoranthene]
Benzo(k)fluoranthene	1,1'-Biphenyl	Bis(2-ethylhexyl)phthalate
Butylbenzylphthalate	Cadmium	Carbazole
Chlorobenzene	Chloroform	Chromium
Chrysene	Cobalt	Copper
Cumene [Isopropylbenzene]	Dibenz(a,h)anthracene	Dibenzofuran
Fluorene	Indeno(1,2,3-cd)pyrene	Lead
2-Methylnaphthalene	Naphthalene	Nickel
Phenanthrene	PCBs [Aroclor-1242 and -1254]	Pyrene
Selenium	Silver	Zinc

[Tables 3 and 4 of this HRS documentation record]

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Observed Release Factor Value: 550

4.1.3.2 Human Food Chain Threat - Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Toxicity Factor Value	River Persistence Factor Value	Food Chain Bioaccumulation Factor Value*	Toxicity/Persistence/ Bioaccumulation Factor Value (Table 4-16)	Ref. 2 Page
Acenaphthene	10	0.4	500	2,000	BI-1
Acenaphthylene	0	0.4	500	0	BI-1
Acetone	1	0.07	0.5	0.035	BI-1
Acetophenone	Values for this compound were not readily available				
Anthracene	10	0.4	50,000	2×10^5	BI-1
Antimony	10,000	1	5	5×10^4	BI-1
Arsenic	10,000	1	500	5×10^6	BI-1
Benz(a)anthracene	1,000	1	50,000	5×10^7	BI-2
Benzo(a)pyrene	**10,000**	**1**	**50,000**	**5×10^8**	**BI-2**
Benzo(b)fluoranthene	Values for this compound were not readily available				
Benzo(g,h,i)perylene	0	1	50,000	0	BI-2
Benzo(j,k)fluorene [Fluoranthene]	100	1	5,000	5×10^5	BI-2, C-1
Benzo(k)fluoranthene	100	1	50,000	5×10^6	BI-2
1,1'-Biphenyl	Values for this compound were not readily available				
Bis(2-ethylhexyl)phthalate	100	1	50,000	5×10^6	BI-2
Butylbenzyl phthalate	10	1	500	5,000	BI-2
Cadmium	**10,000**	**1**	**50,000**	**5×10^8**	**BI-2**
Carbazole	10	0.4	500	2,000	BI-2
Chlorobenzene	100	0.0007	50	3.5	BI-3
Chloroform	100	0.4	5	200	BI-3
Chromium	10,000	1	500	5×10^6	BI-3
Chrysene	10	1	5	50	BI-3
Cobalt	10	1	5,000	5×10^4	BI-3
Copper	0	1	50,000	0	BI-3
Cumene [Isopropylbenzene]	10	0.4	500	2,000	BI-3; Ref. 73
Dibenz(a,h)anthracene	**10,000**	**1**	**50,000**	**5×10^8**	**BI-4**
Dibenzofuran	1,000	1	500	5×10^5	BI-4
Fluorene	100	1	500	5×10^4	BI-6
Indeno(1,2,3-cd)pyrene	1,000	1	50,000	5×10^7	BI-8
Lead	10,000	1	5,000	5×10^7	BI-8
2-Methylnaphthalene	0	0.4	50,000	0	BI-9
Naphthalene	1,000	0.4	50,000	2×10^7	BI-9
Nickel	10,000	1	500	5×10^6	BI-9
Phenanthrene	0	0.4	5,000	0	BI-9
PCBs [Aroclor-1242 and Aroclor-1254]	**10,000**	**1**	**50,000**	**5×10^8**	**BI-10**
Pyrene	100	1	50,000	5×10^6	BI-10
Selenium	100	1	500	5×10^4	BI-10
Silver	100	1	50,000	5×10^6	BI-10
Zinc	10	1	50,000	5×10^5	BI-12

* NYCDEP has reported salinity measurements ranging from 18.5 to 22.8 parts per thousand (ppt) for Newtown Creek in the vicinity of Kosciuszko Bridge, which carries the Brooklyn-Queens Expressway, making it brackish water [Figure 1 of this HRS documentation record; Ref. 52, p. 112]. The HRS (Section 4.1.3.2.1.3) states that if any fisheries being evaluated are in brackish water, assign the higher of the fresh water and salt water bioaccumulation potential factor values to each hazardous substance [Ref. 1, p. 51617]. Therefore, the higher Food Chain Bioaccumulation Potential Factor Values are used for the Newtown Creek fishery.

Benzo(a)pyrene, cadmium, dibenz(a,h)anthracene, and PCBs are the hazardous substances associated with the highest toxicity/persistence/bioaccumulation factor value with a quantity of 5×10^{8}.

4.1.3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (HRS Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1	393,976	no
Sum of Values:	393,976 (rounded to nearest integer as specified in HRS Section 2.4.2.2)	

The sum corresponds to a hazardous waste quantity factor value of 10,000 in Table 2-6 of the HRS. Therefore, a hazardous waste quantity factor value of 10,000 is assigned for the surface water pathway [Ref. 1, p. 51591-51592].

4.1.3.2.3 Waste Characteristics Factor Category Value

Four hazardous substances [benzo(a)pyrene, cadmium, dibenz(a,h)anthracene, and PCBs] associated with the waste source, which has a surface water pathway containment factor greater than 0 for the watershed, corresponds to a Toxicity/Persistence Factor Value of 10,000 and Bioaccumulation Potential Factor Value of 50,000, as shown previously [Ref. 1, pp. 51618, 51620; 2, pp. BI-2, BI-4, BI-10].

(Toxicity/Persistence Factor Value) x (Hazardous Waste Quantity Factor Value) = 10,000 x 10,000 = 1×10^{8}

(Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value)
x (Bioaccumulation Potential Factor Value) = (1×10^{8}) x (50,000) = 5×10^{12}

The product corresponds to a Waste Characteristics Factor Category Value of 1,000 in Table 2-7 of the HRS [Ref. 1, p. 51592].

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Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^{8}
Hazardous Waste Quantity Factor Value: 10,000
Waste Characteristics Factor Category Value: 1,000

4.1.3.3 Human Food Chain Threat - Targets

Blue-claw crabs, bluefish, weakfish, striped bass, and other species inhabit the creek, and fishing and crabbing for human consumption occurs [Ref. 7, pp. 2, 5; 8, p. 11; 21, p. 13; 22, pp. 1-2; 24, p. 143; 52, p. 93; 68, p. 3; 69, p. 1]. Subsistence fishing has been observed in Newtown Creek at Dutch Kills, and crabbing for consumption has been observed at the end of Manhattan Avenue in Brooklyn [Ref. 7, p. 5; 21, p. 13; 22, pp. 1-2; 68, p. 3; 69, p. 1]. These locations are both within the zone of contamination for the Newtown Creek site [Figure 2 of this HRS documentation record]. Therefore, Actual Contamination is documented, and the target fishery is evaluated for Actual Human Food Chain Contamination. There are no media-specific benchmarks for sediment, so the target fishery is subject to Level II concentrations [Ref. 1, pp. 51592-51593, 51620-51621].

Sediment Samples for Observed Release
Note: For each hazardous substance, the sample that showed the maximum concentration is listed.

Sample ID	Distance from PPE	Hazardous Substance	Bioaccumulation Potential Factor Value *	Reference(s)
NC-SD19B	0 feet	Acenaphthene	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD21B	0 feet	Acenaphthylene	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD13B	0 feet	Anthracene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD49B	0 feet	Arsenic	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD68B	0 feet	Benzo(a)anthracene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD68B	0 feet	Benzo(a)pyrene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Benzo(g,h,i)perylene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Benzo(j,k)fluorene [Fluoranthene]	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Benzo(k)fluoranthene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD70A	0 feet	Bis(2-ethylhexyl)phthalate	50,000	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-2
NC-SD22A	0 feet	Butylbenzylphthalate	500	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-2
NC-SD69B	0 feet	Cadmium	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Carbazole	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD65B	0 feet	Chromium	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD52B	0 feet	Cobalt	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD52B	0 feet	Copper	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD55B	0 feet	Cumene [Isopropylbenzene]	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD21B	0 feet	Dibenz(a,h)anthracene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-4

Sample ID	Distance from PPE	Hazardous Substance	Bioaccumulation Potential Factor Value *	Reference(s)
NC-SD19B	0 feet	Dibenzofuran	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-4
NC-SD13B	0 feet	Fluorene	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-6
NC-SD68B	0 feet	Indeno(1,2,3-cd)pyrene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-8
NC-SD65B	0 feet	Lead	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-8
NC-SD60B	0 feet	2-Methylnaphthalene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD55B	0 feet	Naphthalene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD47B	0 feet	Nickel	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD13B	0 feet	Phenanthrene	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD62A	0 feet	PCBs [Aroclor-1242, -1254]	50,000	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-10
NC-SD13B	0 feet	Pyrene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-10
NC-SD49B	0 feet	Selenium	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-10
NC-SD71A	0 feet	Silver	50,000	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-10
NC-SD65B	0 feet	Zinc	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-12

* NYCDEP has reported salinity measurements ranging from 18.5 to 22.8 parts per thousand (ppt) for Newtown Creek in the vicinity of Kosciuszko Bridge, which carries the Brooklyn-Queens Expressway, making it brackish water [Figure 1 of this HRS documentation record; Ref. 52, p. 112]. The HRS (Section 4.1.3.2.1.3) states that if any fisheries being evaluated are in brackish water, assign the higher of the fresh water and salt water bioaccumulation potential factor values to each hazardous substance [Ref. 1, p. 51617]. Therefore, the higher Food Chain Bioaccumulation Potential Factor Values are used for the Newtown Creek fishery. The maximum factor value of 50,000 applies to benzo(a)pyrene, cadmium, dibenz(a,h)anthracene, PCBs, and other substances [Ref. 2, pp. BI-2, BI-4, BI-10].

4.1.3.3.1 Food Chain Individual

Sample ID:	NC-SD62A
Hazardous Substance:	PCBs
Bioaccumulation Potential:	50,000
References:	Figure 2 of this HRS documentation record; Ref. 1, p. 51620; 2, p. BI-2; 35, p. 81

Identity of Fishery	Type of Surface Water Body	Dilution Weight	Reference(s)
Newtown Creek	Coastal tidal water (brackish water)	0.0001	1, p. 51613; 52, p. 112

There is an observed release of hazardous substances, including benzo(a)pyrene, with Bioaccumulation Potential Factor Values of 500 or greater, and there is Level II Actual Contamination of the Newtown Creek fisheries located at the end of Manhattan Avenue in Brooklyn and at Dutch Kills [Figure 2, Tables 3 and 4 of this HRS documentation record; Ref. 1, pp. 51592-51593, 51620; 2, p. BI-2; 12, p. 144; 21, p. 13; 22, pp. 1-2; 68, p. 3; 76, p. 1] . Therefore, a Food Chain Individual Factor Value of 45 is assigned [Ref. 1, p. 51620].

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Food Chain Individual Factor Value: 45

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

There are no media-specific benchmarks for sediment. Therefore, there are no fisheries subject to Level I concentrations and the Level I Concentrations Factor Value is 0 [Ref. 1, pp. 51592-51593, 51620-51621].

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Level I Concentrations Factor Value: 0

4.1.3.3.2.2 Level II Concentrations

Blue-claw crabs, bluefish, weakfish, striped bass, and other species inhabit the creek, and fishing and crabbing for human consumption occurs [Ref. 7, pp. 2, 5; 8, p. 11; 21, p. 13; 22, pp. 1-2; 24, p. 143; 52, p. 93; 68, p. 3; 69, p. 1; 76, p. 1]. Subsistence fishing has been observed in Newtown Creek at Dutch Kills, and crabbing for consumption has been observed at the end of Manhattan Avenue in Brooklyn [Ref. 7, p. 5; 21, p. 13; 22, pp. 1-2; 68, p. 3; 69, p. 1]. These locations are both within the zone of contamination for the Newtown Creek site [Figure 2 of this HRS documentation record]. The fish consumption rate for the Newtown Creek fishery is not documented, so the fishery is assigned to the category “Greater than 0 to 100 pounds per year” [Ref. 1, p. 51621; 12, p. 144; 21, p. 13; 22, pp. 1-2]. The category corresponds to the assigned Human Food Chain Population Value of 0.03 in Table 4-18 of the HRS, which is assigned as the Level II Concentrations Factor Value [Ref. 1, p. 51621].

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Level II Concentrations Factor Value: 0.03

4.1.3.3.2.3 Potential Human Food Chain Contamination

People catch fish and crabs for consumption from the rest of the New York-New Jersey Harbor Estuary within the 15-mile TDL of the site, including the East River and Hudson River [Ref. 10, pp. 6-7; 70, pp. 1-2; 71, pp. 1-2; 72, p. 1; 76, p. 1]. The fish consumption rate for the downstream fishery is not documented, so the fishery is assigned to the category “Greater than 0 to 100 pounds per year” , which corresponds to the assigned Human Food Chain Population Value of 0.03 in Table 4-18 of the HRS [Ref. 1, p. 51621].

Identity of Fishery	Annual Production (pounds)	Type of Surface Water Body	Average Annual Flow (cfs)	Population Value (P_i)	Dilution Weight (D_i)	P_i x D_i
New York Harbor	0-100	Coastal tidal water	N/A	0.03	0.0001	0.000003

Sum of P_i x D_i: 0.000003
(Sum of P_i x D_i)/10: 0.0000003

[Figures 1, 2 of this HRS documentation record; Ref. 1, pp. 51613, 51621; 70, pp. 1-2; 71, pp. 1-2; 72, p. 1]

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Potential Human Food Chain Contamination Factor Value: 0.0000003

4.1.4.2 Environmental Threat - Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Ecotoxicity Factor Value*	River Persistence Factor Value	Environment Bioaccumulation Factor Value*	Ecotoxicity/Persistence/ Bioaccumulation Factor Value (Table 4-21)*	Ref. 2 Page
Acenaphthene	10,000	0.4	500	2×10^6	BI-1
Acenaphthylene	0	0.4	500	0	BI-1
Acetone	100	0.07	0.5	3.5	BI-1
Acetophenone	Values for this compound were not readily available				
Anthracene	10,000	0.4	50,000	2×10^8	BI-1
Antimony	100	1	50	5,000	BI-1
Arsenic	100	1	5,000	5×10^5	BI-1
Benz(a)anthracene	**10,000**	**1**	**50,000**	$\mathbf{5 \times 10^8}$	**BI-2**
Benzo(a)pyrene	**10,000**	**1**	**50,000**	$\mathbf{5 \times 10^8}$	**BI-2**
Benzo(b)fluoranthene	Values for this compound were not readily available				
Benzo(g,h,i)perylene	0	1	50,000	0	BI-2
Benzo(j,k)fluorene [Fluoranthene]	10,000	1	5,000	5×10^7	BI-2, C-1
Benzo(k)fluoranthene	0	1	50,000	0	BI-2
1,1'-Biphenyl	Values for this compound were not readily available				
Bis(2-ethylhexyl)phthalate	1,000	1	50,000	5×10^7	BI-2
Butylbenzyl phthalate	1,000	1	500	5×10^5	BI-2
Cadmium	**10,000**	**1**	**50,000**	$\mathbf{5 \times 10^8}$	**BI-2**
Carbazole	1,000	0.4	500	2×10^5	BI-2
Chlorobenzene	10,000	0.0007	5,000	3.5×10^4	BI-3
Chloroform	100	0.4	500	2×10^4	BI-3
Chromium	10,000	1	500	5×10^6	BI-3
Chrysene	1,000	1	5,000	5×10^6	BI-3
Cobalt	0	1	5,000	0	BI-3
Copper	1,000	1	50,000	5×10^7	BI-3
Cumene [Isopropylbenzene]	100	0.4	500	2×10^4	BI-3; Ref. 73
Dibenz(a,h)anthracene	0	1	50,000	0	BI-4
Dibenzofuran	1,000	1	500	5×10^5	BI-4
Fluorene	1,000	1	5,000	5×10^6	BI-6
Indeno(1,2,3-cd)pyrene	0	1	50,000	0	BI-8
Isopropylbenzene	Values for this compound were not readily available				
Lead	1,000	1	50,000	5×10^7	BI-8
2-Methylnaphthalene	1,000	0.4	50,000	2×10^7	BI-9
Naphthalene	1,000	0.4	50,000	2×10^7	BI-9
Nickel	1,000	1	500	5×10^5	BI-9
Phenanthrene	10,000	0.4	50,000	2×10^8	BI-9
PCBs [Aroclor-1242 and Aroclor-1254]	**10,000**	**1**	**50,000**	$\mathbf{5 \times 10^8}$	**BI-10**
Pyrene	**10,000**	**1**	**50,000**	$\mathbf{5 \times 10^8}$	**BI-10**
Selenium	1,000	1	500	5×10^5	BI-10
Silver	**10,000**	**1**	**50,000**	$\mathbf{5 \times 10^8}$	**BI-10**
Zinc	100	1	50,000	5×10^6	BI-12

* NYCDEP has reported salinity measurements ranging from 18.5 to 22.8 parts per thousand (ppt) for Newtown Creek in the vicinity of Kosciuszko Bridge, which carries the Brooklyn-Queens Expressway, making it brackish water [Figure 1 of this HRS documentation record; Ref. 52, p. 112]. The HRS (Section 4.1.4.2.1.1) states that if any sensitive environments being evaluated are in brackish water, assign the higher of the fresh water and marine water toxicity factor values to each hazardous substance [Ref. 1, p. 51621]. Therefore, the higher Ecosystem Toxicity Factor Value for each hazardous substance is used for Newtown Creek. Similarly, the HRS (Section 4.1.4.2.1.3) states that if any sensitive environments being evaluated are in brackish water, assign the higher of the fresh water and salt water bioaccumulation potential factor values to each hazardous substance [Ref. 1, pp. 51617, 51622]. Therefore, the higher Ecosystem Bioaccumulation Potential Factor Value for each hazardous substance is used for Newtown Creek.

Benzo(a)anthracene, benzo(a)pyrene, cadmium, PCBs, pyrene, and silver are the hazardous substances associated with the highest ecotoxicity/persistence/ bioaccumulation factor value with a quantity of 5×10^8.

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Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8

4.1.4.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (HRS Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1	393,976	no

Sum of Values: 393,976 (rounded to nearest integer as specified in HRS Section 2.4.2.2)

The sum corresponds to a hazardous waste quantity factor value of 10,000 in Table 2-6 of the HRS. Targets are subject to Level II concentrations. Therefore, a hazardous waste quantity factor value of 10,000 is assigned for the surface water pathway [Ref. 1, p. 51591-51592].

4.1.4.2.3 Waste Characteristics Factor Category Value

Four hazardous substances [benzo(a)anthracene, PCBs, pyrene, and silver] associated with the waste source, which has a surface water pathway containment factor greater than 0 for the watershed, corresponds to an Ecotoxicity/Persistence Factor Value of 10,000 and Bioaccumulation Potential Factor Value of 50,000, as shown previously [Ref. 1, pp. 51618, 51620; 2, pp. BI-2, BI-10].

(Ecotoxicity/Persistence Factor Value) x (Hazardous Waste Quantity Factor Value) = 10,000 x 10,000 = 1 x 10^8

(Ecotoxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value)
x (Bioaccumulation Potential Factor Value) = (1 x 10^8) x (50,000) = 5 x 10^{12}

The product corresponds to a Waste Characteristics Factor Category Value of 1,000 in Table 2-7 of the HRS [Ref. 1, p. 51592].

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Hazardous Waste Quantity Factor Value: 10,000
Waste Characteristics Factor Category Value: 1,000

4.1.4.3 Environmental Threat - Targets

Newtown Creek is part of the New York-New Jersey Harbor Estuary, which is a sensitive area identified under the National Estuary Program [Ref. 10, pp. 1-10]. Therefore, Actual Contamination is documented, and the target sensitive environment is evaluated for Actual Contamination. There are no media-specific benchmarks for sediment, so the target sensitive environment is subject to Level II concentrations [Ref. 1, pp. 51592-51593, 51624-51625].

Sediment Samples for Observed Release
Note: For each hazardous substance, the sample that showed the maximum concentration is listed.

Sample ID	Distance from PPE	Hazardous Substance	Bioaccumulation Potential Factor Value *	Reference(s)
NC-SD19B	0 feet	Acenaphthene	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD21B	0 feet	Acenaphthylene	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD13B	0 feet	Anthracene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD49B	0 feet	Arsenic	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-1
NC-SD68B	0 feet	Benzo(a)anthracene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD68B	0 feet	Benzo(a)pyrene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Benzo(g,h,i)perylene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Benzo(j,k)fluorene [Fluoranthene]	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Benzo(k)fluoranthene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD70A	0 feet	Bis(2-ethylhexyl)phthalate	50,000	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-2
NC-SD22A	0 feet	Butylbenzylphthalate	500	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-2
NC-SD69B	0 feet	Cadmium	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD13B	0 feet	Carbazole	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-2
NC-SD65B	0 feet	Chromium	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD52B	0 feet	Cobalt	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD52B	0 feet	Copper	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD55B	0 feet	Cumene [Isopropylbenzene]	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-3
NC-SD21B	0 feet	Dibenz(a,h)anthracene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-4
NC-SD19B	0 feet	Dibenzofuran	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-4
NC-SD13B	0 feet	Fluorene	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-6

Sample ID	Distance from PPE	Hazardous Substance	Bioaccumulation Potential Factor Value *	Reference(s)
NC-SD68B	0 feet	Indeno(1,2,3-cd)pyrene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-8
NC-SD65B	0 feet	Lead	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-8
NC-SD60B	0 feet	2-Methylnaphthalene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD55B	0 feet	Naphthalene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD47B	0 feet	Nickel	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD13B	0 feet	Phenanthrene	5,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-9
NC-SD62A	0 feet	PCBs [Aroclor-1242, -1254]	50,000	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-10
NC-SD13B	0 feet	Pyrene	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-10
NC-SD49B	0 feet	Selenium	500	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-10
NC-SD71A	0 feet	Silver	50,000	Figure 2; Table 3; Ref. 1, p. 51620; 2, p. BI-10
NC-SD65B	0 feet	Zinc	50,000	Figure 2; Table 4; Ref. 1, p. 51620; 2, p. BI-12

* NYCDEP has reported salinity measurements ranging from 18.5 to 22.8 parts per thousand (ppt) for Newtown Creek in the vicinity of Kosciuszko Bridge, which carries the Brooklyn-Queens Expressway, making it brackish water [Figure 1 of this HRS documentation record; Ref. 52, p. 112]. The HRS (Section 4.1.4.2.1.1) states that if any sensitive environments being evaluated are in brackish water, assign the higher of the fresh water and marine water toxicity factor values to each hazardous substance [Ref. 1, p. 51621]. Therefore, the higher Ecosystem Toxicity Factor Value for each hazardous substance is used for Newtown Creek. Similarly, the HRS (Section 4.1.4.2.1.3) states that if any sensitive environments being evaluated are in brackish water, assign the higher of the fresh water and salt water bioaccumulation potential factor values to each hazardous substance [Ref. 1, p. 51622]. Therefore, the higher Ecosystem Bioaccumulation Potential Factor Value for each hazardous substance is used for Newtown Creek. The maximum factor value of 50,000 applies to benzo(a)anthracene, PCBs, pyrene, silver, and other substances [Ref. 2, pp. BI-2, BI-10].

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

There are no media-specific benchmarks for sediment. Therefore, there are no sensitive environments subject to Level I concentrations and the Level I Concentrations Factor Value is 0 [Ref. 1, pp. 51592-51593, 51624-51625].

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Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

Newtown Creek is part of the New York-New Jersey Harbor Estuary, which is a sensitive area identified under the National Estuary Program [Ref. 10, pp. 1-10].

Sensitive Environment	Distance from PPE to Sensitive Environment	Reference	Sensitive Environment Value(s)
NY-NJ Harbor Estuary (Sensitive Area identified under National Estuary Program)	0.00 mile	1, pp. 51624-51625; 10, pp. 1-10	100

Sum of Sensitive Environments Value: 100

Wetlands

Wetland	Wetland Frontage	Reference(s)
N/A		

Total Wetland Frontage: N/A
Wetland Value: 0

Sum of Sensitive Environments Value + Wetland Value: 0

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Level II Concentrations Factor Value: 100

4.1.4.3.1.3 Potential Contamination

Since a maximum score of 100.00 was achieved for the surface water migration pathway, the Potential Contamination Factor Value was not scored (NS).

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Potential Contamination Factor Value: NS